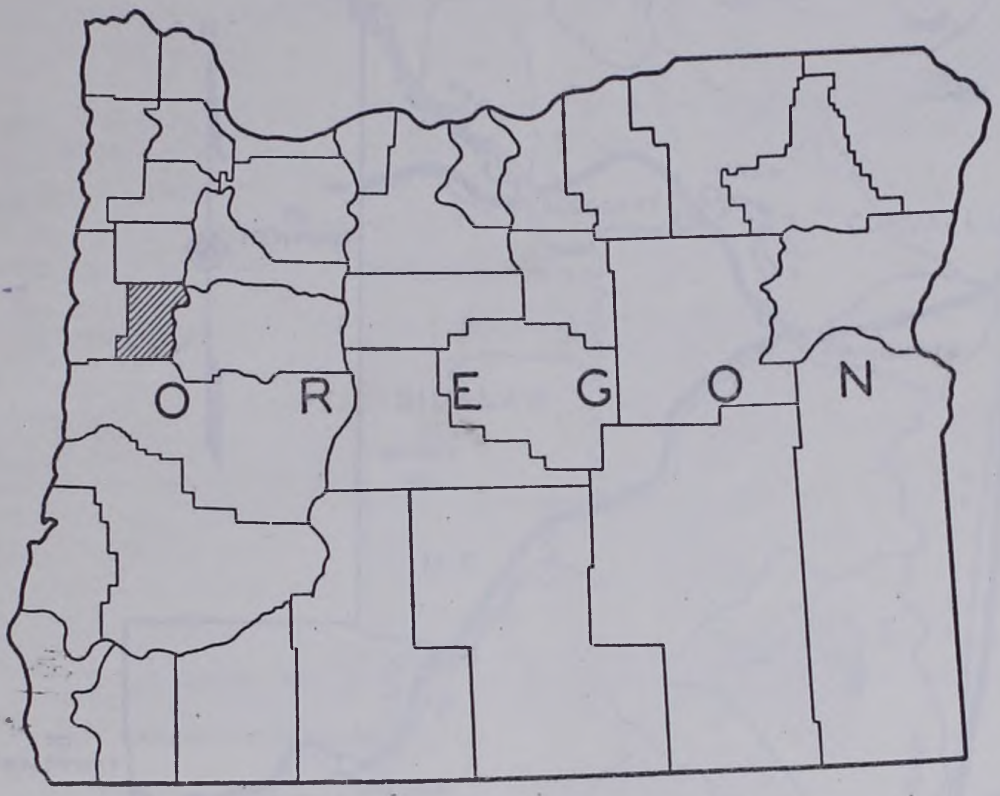
FORESTRY LIBRARY
251 GIANNINI HALL
UNIVERSITY OF CALIFORNIA
BERKELEY

FORESTRY BUILDING
UNIVERSITY OF CALIFORNIA
BERKELEY.

FOREST STATISTICS
FOR
BENTON COUNTY, OREGON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1940

FOREST SURVEY REPORT NO. 85



U. S. DEPARTMENT OF AGRICULTURE — FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
STEPHEN N. WYCKOFF, DIRECTOR

R.W. COWLIN, IN CHARGE OF FOREST SURVEY — F.L. MORAVETS, ASSISTANT

PORTLAND, OREGON

JULY 21, 1941

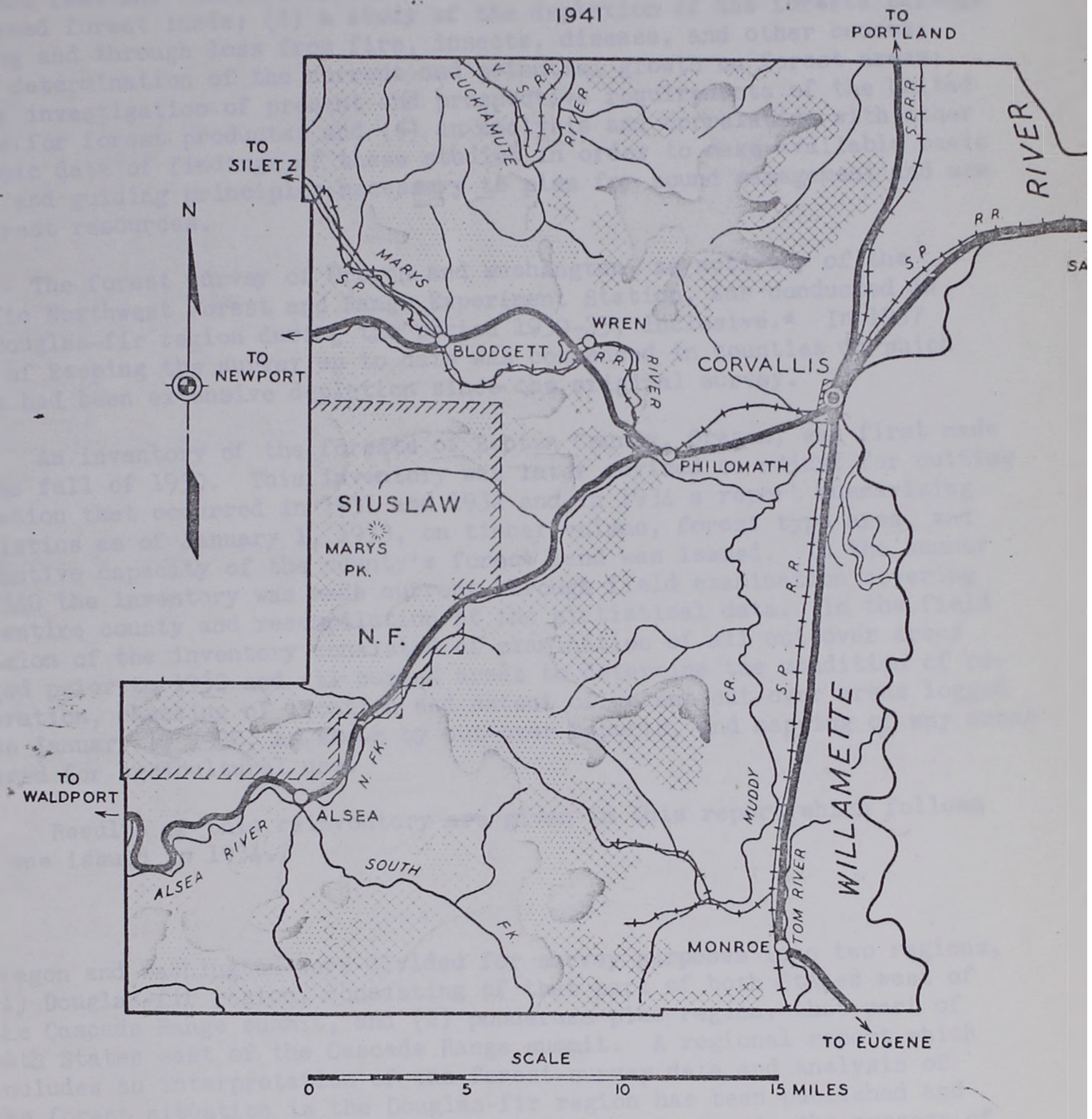
FIGURE 1

OUTLINE MAP

OF

BENTON COUNTY, OREGON

1941



LEGEND

- SAW TIMBER
- DEFORESTED CUTOVERS AND BURNS
- SECOND GROWTH
- NONCOMMERCIAL FORESTS AND NONFOREST LAND

FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and of timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of findings of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33, inclusive.* In 1937 work of keeping the survey up to date was commenced in counties in which there had been extensive depletion since the original survey.

An inventory of the forests of Benton County, Oregon, was first made in the fall of 1930. This inventory was later revised to adjust for cutting depletion that occurred in 1931 and 1932 and in 1934 a report summarizing statistics as of January 1, 1933, on timber volume, forest type area, and productive capacity of the county's forest land was issued. In the summer of 1940 the inventory was made current through field examination covering the entire county and recompilation of the statistical data. In the field revision of the inventory consisted of examination of all cut-over areas logged prior to 1930 and all burned areas to determine the condition of re-generation, checking of location and extent of recent cut-over areas logged since January 1, 1930, as shown by cut-over reports, and mapping of any areas cleared for agricultural use.

Results of this reinventory are given in this report which follows the one issued in 1934.

* Oregon and Washington were divided for survey purposes into two regions, (1) Douglas-fir region, consisting of that part of both States west of the Cascade Range summit, and (2) ponderosa pine region, that part of both States east of the Cascade Range summit. A regional report which includes an interpretation of the forest-survey data and analysis of the forest situation in the Douglas-fir region has been published and a similar report for the ponderosa pine region is now in the process of being published. Each region was divided into units--11 in the Douglas-fir region and 7 in the ponderosa pine region--for the purpose of more intensive analysis of data. It is planned to issue reports presenting findings for each unit.

FOREST STATISTICS FOR BENTON COUNTY, OREGON

Contents

	Page
Introduction	1
Physical character of the county	1
Agricultural zone	2
Forest zone	2
Conifer saw timber	3
Conifer second growth	6
Conifer seedlings and saplings	8
Recent cut-over areas	8
Nonrestocked cut-over and burned areas	8
Hardwoods	9
Noncommercial areas	9
Site quality	9
Merchantable timber volume	9
Ownership of forest resources	12
Forest industry	13
Forest growth	13
Comparison of inventories	15
Conclusions	

Figures

1. Outline map of Benton County, Oregon	Inside cover

Tables

1. Area, in acres, of all forest cover types, by ownership class	4
2. Area, in acres, of generalized forest types, by ownership class	5
3. Area, in acres, of certain immature conifer forest types, by age class and degree of stocking	7
4. Land areas, forest land areas, and commercial conifer area, by site quality class	10
5. Volume of timber by species and ownership class	11

FOREST STATISTICS FOR BENTON COUNTY, OREGON[1/]

By F. L. Moravets[2/]

Although the forests of Benton County, Oregon, have been utilized for nearly a century, the saw-timber stands were not extensive enough and of a character to attract large-scale operations. Fires, several of which occurred during the first half of the nineteenth century, so broke up the continuity of the county's virgin forest cover that early timber seekers found only scattered old-growth stands of limited extent intermingled with second-growth stands and deforested areas. As a consequence, the pattern of forest-land ownership is made up of small holdings--to a far greater degree than is found in most counties in the Douglas-fir region.

Under such conditions, the forest industry developed in the county has been comprised of small individual units and the progress of logging through the forest zone, while penetrating to practically all portions of the zone, has been spotted and intermittently timed. It is improbable that the remaining saw-timber stands, the majority of which are of second-growth timber, will invite an expanded industry. Rather, it is probable that several of the present-day sawmills will be abandoned in a few years.

The forestry situation need not become too hopeless, however, since more than one-half of the forest land is stocked with second-growth timber, from seedling to saw-timber size, and these stands, if properly managed, can sustain in the future a forest industry of considerable capacity.

In this analysis of the data obtained in the original and revised inventories, an attempt will be made to show the trend of timber supply, rate of depletion, and rate of replenishment through growth.

Physical Character of the County

Situated in west central Oregon, Benton County lies in the upper Willamette River Valley, extending westward from the river to a boundary a few miles beyond the summit of the Coast Range. North and south the

---

1/ Assistance in the compilation of the data contained in this report was furnished by the personnel of Work Projects Administration official project 65-2-94-144.

2/ Field work of the revised inventory of the county's forest resources was done by D. L. Lynch, and compilation of the data by E. D. Buell, Edna L. Hunt, B. C. Baker, T. J. Rowe, and W. E. Zeuthen.

county is 30 miles in length; east and west it varies from 17 to 26 miles in width. Total land area was computed by the survey to be 417,115 acres.

In general, the topography of the county is not severe. The valley proper, bordering the Willamette River and from 6 to 8 miles in width, is only slightly undulating. Gentle slopes leading from the valley to the summit of the Coast Range are cut by relatively shallow stream courses. Westward of the summit, the slopes are more abrupt and stream courses more deeply cut.

Drainage is well defined. Practically all but the southwestern quarter of the county drains into the Willamette River through the Luckiamute, Marys, and Long Tom Rivers and Muddy Creek. The southwestern portion drains to the Pacific Ocean through the Alsea River and tributaries.

The county clearly divides into two land-use zones--the agricultural zone occupying the eastern two-fifths of the county, and the forest zone occupying the western three-fifths.

Agricultural Zone

The agricultural zone includes all of the valley portion of the county and extends for a short distance up the lower slopes of the foothills of the Coast Range. Forest cover within this zone is very limited, consisting of small scattered bodies of conifer second growth in the northern portion of the zone, stringers of northern black cottonwood, Oregon ash, red alder, and bigleaf maple along the streams, and small areas of Oregon white oak throughout most of the zone.

Development of the agricultural lands in the county, which began nearly a century ago, was fairly rapid since most of the valley portion was open prairie country and no arduous task of clearing was necessary to bring them under cultivation.

The present agricultural industry consists of general farming, orcharding, production of small fruits and vegetables, livestock and poultry raising, and a system of food-processing and marketing facilities. According to Bureau of the Census statistics for 1940 there was a total of 1,507 farms in the county in comparison to a total of 1,340 in 1930. Statistics for 1940 on the number of persons engaged in agriculture in the county are not yet available but those for 1930 show 39 percent of the gainfully employed directly occupied in agriculture. In view of the greater number of farms in 1940 it is probable that there has been an increase in the percentage of the gainfully employed engaged in agriculture.

Forest Zone

In addition to the early fires that broke up the virgin forests of the county, logging and land-clearing operations and subsequent fires

have made further inroads until the present cover pattern in the forest zone is characterized by the large number of type areas, small in extent and intermingled to an unusual degree. No large contiguous forest type areas remain.

Because of the ownership pattern and the isolated character of the saw-timber stands, logging operations have not been concentrated. Many of the burned-over and cut-over lands have restocked, resulting in stands of conifer second growth of varying age. On other of these deforested lands regeneration has failed because of repeated fires and bracken fern patches have resulted. The clearing of land within the forest zone for agricultural use has been confined principally to the valleys; however, the cleared areas comprise an appreciable acreage and are a part of the intermingled cover type pattern.

Although figure 1 shows in a general way the forest cover in the county, the patchwork pattern is best shown in the detailed forest type map of the county[3/] which gives the segregation of cover by age class and degree of stocking and differentiates between areas deforested by fire and by logging.

As shown in table 1, which gives the area of forest cover types by ownership class, the survey classified 237,725 acres as forest land. This total represents 57 percent of the county's land area. Table 2 groups the forest cover types into seven generalized types. Each of these generalized types will be briefly discussed.

Conifer Saw Timber

Areas of saw timber shown in figure 1 in the northern portion of the county in the Luckiamute River drainage are almost entirely stocked with second-growth Douglas-fir timber from 20 to 40 inches in diameter breast height (type 8). Solid bodies of this class of timber in this part of the county are not extensive; the larger individual areas range from 2 to 5 thousand acres. Most of these stands are from 70 to 90 years of age. Further south in the Marys Peak district there is one relatively large body of saw timber of approximately 15 thousand acres comprised of both old- and second-growth Douglas-fir. Several bodies of saw timber, principally old growth, remain in the Alsea River drainage in the southwestern portion of the county. The largest of these lies on the South Fork.

Combined the saw-timber stands in the county cover a total of approximately 92 thousand acres or about 39 percent of the forest land

---

3/ One-inch-to-the-mile county type maps and $\frac{1}{4}$-inch-to-the-mile lithographed State type maps have been prepared to show the location and extent of the forest cover types. For information on them, address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland, Oregon.

Table 1.-Area, in acres, of all forest cover types, by ownership class
Data corrected to October 1, 1940

Survey type no.	Type	Private	State[1]	County	Municipal	Federal[1]			Total
						Revested land grant	Public domain	National forest	
	Woodland								
4	Oak	1,930	20						1,950
	Douglas-fir								
6	Large old growth	4,400	140	320	145	5,865	105	2,105	13,080
7	Small old growth	15,560	400	680	750	9,360	75	3,210	30,035
8	Large second growth	33,230	2,805	1,130	755	6,920	700	2,575	48,115
9	Small second growth	46,850	4,205	1,215	590	9,840	2,885	890	66,475
10	Seedlings and saplings	10,010	1,160	730	90	2,645	715	790	16,140
	Western hemlock								
14	Large					60			60
15	Small	25				65			90
29	Grand fir, large	115	40		50		5	60	270
	Hardwood								
31.5	Large	1,540	25	15		205	20	105	1,910
31	Small	3,955	425	100		215	40	20	4,755
	Nonrestocked cutover								
35	Cut prior to 1920	470	210					40	720
35A	Cut from 1920-29, incl.	10,975	325	660		1,740		165	13,865
36	Recent cut, since 1920	13,655	525	395		4,215	10		18,800
37	Deforested burn	10,345	2,320	900	40	6,120	1,535	200	21,460
	Total forest types	153,060	12,600	6,145	2,420	47,250	6,090	10,160	237,725
	Nonforest land								
3	Cultivated	175,215	975	150		155	10		176,505
2	Other	1,920	530	15	190	115	100	15	2,885
	Total	330,195	14,105	6,310	2,610	47,520	6,200	10,175	417,115

1/ Available for cutting.

Table 2.-Area, in acres, of generalized forest types, by ownership class
Data corrected to October 1, 1940

Type definition	Private	State[1]	County	Municipal	Federal[1]			Total
					Revested land grant	Public domain	National forest	
Conifer saw timber Types 6, 7, 8, 14, and 29	53,305	3,385	2,130	1,700	22,205	885	7,950	91,560
Conifer second growth Types 9 and 15								
On cut-over areas	17,320	535	565	210	455			19,085
On old burns	29,555	3,670	650	380	9,450	2,885	890	47,480
Total	46,875	4,205	1,215	590	9,905	2,885	890	66,565
Conifer seedlings and saplings Type 10								
On cut-over areas	7,215	1,005	420	55	1,080		755	10,530
On old burns	2,795	155	310	35	1,565	715	35	5,610
Total	10,010	1,160	730	90	2,645	715	790	16,140
Recent cut-over areas Type 36	13,655	525	395		4,215	10		18,800
Nonrestocked cut-over and burned areas Types 35, 35A, and 37	21,790	2,855	1,560	40	7,860	1,535	405	36,045
Hardwoods Types 31 and 31.5	5,495	450	115		420	60	125	6,665
Noncommercial areas Type 4	1,930	20						1,950
Total forest types	153,060	12,600	6,145	2,420	47,250	6,090	10,160	237,725
Nonforest land Types 2 and 3	177,135	1,505	165	190	270	110	15	179,390
Total	330,195	14,105	6,310	2,610	47,520	6,200	10,175	417,115

1/ Available for cutting.

in the county. On all but a very small acreage Douglas-fir is the predominant species, usually comprising at least 90 percent of the merchantable volume of the stand. Grand fir, western redcedar, and western hemlock occur in most of the Douglas-fir stands in varying small amounts as scattered individual trees.

Second-growth Douglas-fir saw timber (type 8) stocks a total of 48 thousand acres. Stands of this timber vary from 70 to 160 years of age and average about 25 thousand board feet per acre net volume. Some old-growth timber remains in these stands but usually contains considerable defect. The second-growth timber is generally sound, thrifty, and of very good quality.

A total of 30 thousand acres is stocked with old-growth Douglas-fir in which the majority of the volume is in trees from 20 to 40 inches d.b.h. (type 7). This type, known as small old growth, contains a considerable volume in large old trees and a small volume in thrifty second-growth trees. Net volume in these stands averages about 45 thousand board feet per acre. Most of the defect is in the larger older trees.

The area occupied by large old-growth Douglas-fir more than 40 inches d.b.h. (type 6) has been reduced to 13 thousand acres. The bulk of the cutting in the past has been of this class of timber and the remaining acreage is comprised of small scattered tracts. These stands range from 250 to 400 years of age and contain a relatively high percentage of cull timber. The large old trees are particularly defective and often quite rough and coarse in quality. Net volume per acre in these stands averages about 35 thousand board feet.

Conifer Second Growth

Conifer second-growth stands, in which the trees are from 6 to 20 inches d.b.h. (types 9 and 15), occupy a total of nearly 67 thousand acres or 28 percent of the county's forest land. Although these stands range from 20 to 90 years in age, there is an uneven distribution among the age classes. Approximately 33 thousand acres, or nearly one-half of the total acreage of this class of timber, is stocked with stands in the 40-year age class and nearly 89 percent is stocked with stands in the 30-, 40-, and 50-year age classes, table 3.

As in the saw-timber stands, these immature stands are composed almost exclusively of Douglas-fir; on all but 90 acres this species comprised 60 percent or more of the number of stems in the stand.

The degree of stocking of the Douglas-fir second-growth stands of this size class is relatively high. Table 3 shows 46 thousand acres, or about 70 percent of the total acreage in the type, medium stocked and the bulk of the remainder well stocked.

Table 3.-Area, in acres, of certain immature conifer forest types, by age class and degree of stocking
Data corrected to October 1, 1940

Age class (years)	Degree of stocking	Type number and name			
		10 Douglas-fir seedlings and saplings	9 Douglas-fir small second growth	15 Western hemlock small second growth	Total
10	Good	775			775
	Medium	4,370			4,370
	Poor	2,575			2,575
	Total	7,720			7,720
20	Good	30			30
	Medium	6,695			6,695
	Poor	1,695	25		1,720
	Total	8,420	25		8,445
30	Good		4,360		4,360
	Medium		9,750		9,750
	Poor		285	40	325
	Total		14,395	40	14,435
40	Good		6,670		6,670
	Medium		25,035		25,035
	Poor		1,170		1,170
	Total		32,875		32,875
50	Good		2,590		2,590
	Medium		7,885		7,885
	Poor		1,230	50	1,280
	Total		11,705	50	11,755
60	Good		1,190		1,190
	Medium		1,425		1,425
	Poor				
	Total		2,615		2,615
70	Good		430		430
	Medium		1,650		1,650
	Poor		1,290		1,290
	Total		3,370		3,370
80	Good		805		805
	Medium		300		300
	Poor				
	Total		1,105		1,105
90+	Good		120		120
	Medium		265		265
	Poor				
	Total		385		385
Total all ages	Good	805	14,050		14,855
	Medium	11,065	46,435		57,500
	Poor	4,270	5,990	90	10,350
	Total	16,140	66,475	90	82,705

Conifer Seedlings and Saplings

In relation to the area of cut-over and burned-over land in the county, there is a very small acreage stocked with seedling and sapling stands, in which the trees are less than 6 inches d.b.h. The total of 16 thousand acres stocked by these young stands is only about 7 percent of the county's total forest land area.

In general, regeneration of areas logged in the last 2 or 3 decades has not been satisfactory. Due to recurring fires and severe competition from brush, weeds, and fern, conifer seedlings have not become established on many of the areas. The burned-over areas, most of which were deforested several decades ago, support such a heavy stand of bracken fern that conifer reproduction is precluded.

Douglas-fir is the key tree in all of the seedling and sapling stands in the county.

The degree of stocking in the seedling and sapling stands is not as high as in the pole-size stands. Approximately the same percentage of the total acreage is medium stocked; however, only a very small percentage is well stocked.

Recent Cut-Over Areas

A total of nearly 19 thousand acres was clear cut in the county from January 1, 1930, to the time of the reinventory in 1940. These lands, classified by the survey as recent cut-over areas, were not examined to determine the degree of regeneration.

One fairly large tract of this type lies at the head of the North Fork of the Alsea River. The bulk of the remainder of the type's acreage is in the northern one-third of the county's forest zone, being comprised of scattered tracts from 80 to 1,000 acres in extent.

Nonrestocked Cut-Over and Burned Areas

All deforested areas logged prior to 1930 or burned over regardless of date of burning, not under cultivation or intensively grazed, were classified by the survey as nonrestocked cut-over and burned areas.

Of the total of 14,585 acres of cut-over land so classified, only 720 acres or less than 5 percent was logged prior to 1920, leaving a total of 13,865 acres of land cut during the decade 1920-29 that was nonrestocked. As data gathered in 1931 show that approximately 17 thousand acres was clear cut during this decade, it is apparent that less than 20 percent had become restocked by 1940.

The acreage of nonrestocked burned-over areas was approximately 1 thousand acres less in 1940 than in 1932.

Hardwoods

Practically all of the total of 6,665 acres typed as hardwoods is in the agricultural zone, most of it along the Willamette River and Muddy Creek.

The stands on only about 29 percent of the total hardwood acreage contained merchantable saw-timber volume.

Noncommercial Areas

Areas totaling about 2 thousand acres stocked with a scrubby growth of Oregon white oak were placed in this generalized type category. Stands of this species of merchantable character were classified as hardwood type.

Site Quality

In productive capacity, the forest soils of Benton County are considerably below the average for the Douglas-fir region of western Oregon and western Washington. As shown in table 4, a total of 229 thousand acres was classified as commercial conifer land and rated by the survey as to its forest-productive capacity. Of this area, only 2.4 percent was classed as site quality II and none as site quality I. In the Douglas-fir region as a whole approximately 30 percent of the acreage rated by the Douglas-fir classification was placed in these two most productive site quality classes. Ninety-four percent of Benton County's conifer land is of site III in contrast to about 43 percent of the region's land. However, only a small percentage of the county's land was placed in site IV and none in site V, the two least productive classes.

Merchantable Timber Volume

The reinventory showed a merchantable timber volume of 2,492 million board feet, log scale, Scribner rule, in the county. The preponderance of Douglas-fir is clearly shown in table 5, which gives the volume by species and ownership class. Total volume of this species was 2,341 million board feet, of which 1,448 million board feet, or 62 percent, was old-growth timber.

Less than 1 percent of the total volume was hardwood.

Ownership of Forest Resources

The ownership of forest resources in Benton County is somewhat unusual in the Douglas-fir region in that there are no large individual holdings, either private or public. Also the private and the various classes of public ownerships are intermingled to an unusual extent.

Of the 238 thousand acres of forest land in the county, 153 thousand acres, or 64 percent, is in private ownership and the remainder

Table 4.-Land areas, forest land areas, and commercial conifer areas, by site quality class 1/
Data corrected to October 1, 1940

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class II	5,495	1.3	2.3	2.4
Class III	215,365	51.6	90.6	94.0
Class IV	8,250	2.0	3.5	3.6
Total commercial conifer	229,110	54.9	96.4	100.0
Woodland	1,950	.5	.8	
Hardwood	6,665	1.6	2.8	
Total other	8,615	2.1	3.6	
All forest land	237,725	57.0	100.0	
Nonforest land	179,390	43.0		
Grand total	417,115	100.0		

1/ The "site quality" of a forest area is its relative productive capacity, determined by climatic, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for Douglas-fir types, class I being the highest. In the survey Douglas-fir classifications were used not only for types in which this species is dominant but also for other types for which no site quality classifications have been developed.

Table 5.-Volume of timber by species and ownership class
Data corrected to October 1, 1940

Trees 16" and more d.b.h.[1]
Thousands of board feet, log scale, Scribner rule

Species	Private	State[2]	County	Municipal	Federal[2]			Total
					Revested land grant	Public domain	National forest	
Douglas-fir	379,321	5,426	14,871	10,938	197,336	1,899	211,657	821,448
Large old growth	315,952	3,206	11,820	6,637	184,053	1,525	103,490	626,683
Small old growth	472,039	32,469	21,258	10,849	146,428	8,560	35,630	727,233
Large second growth	108,622	2,056	2,857	2,343	39,060	480	10,592	166,010
Small second growth								
Western hemlock	9,931		1,020		8,222		13,087	32,260
Large	1,105		113		915		1,454	3,587
Small								
Western redcedar	13,829	13	607	182	15,824	2	5,784	36,241
Live	159				185		46	390
Dead	51,262	1,050	20	2,861	732	282	4,168	60,375
Grand fir							126	126
Noble fir	1,611	19	139	50	902	37	648	3,406
Red alder	6,025	106	272	280	3,078	30	1,296	11,087
Bigleaf maple	1,388							1,388
Northern black cottonwood	1,070	5						1,075
Oregon white oak	1,090	10						1,100
Oregon ash								
Total	1,363,404	44,360	52,977	34,140	596,735	12,815	387,978	2,492,409

1/ Trees of hardwood species taken from 12" and more d.b.h.
2/ Available for cutting.

is in some form of public ownership. Slightly smaller percentages of the remaining acreage of saw timber and merchantable timber volume--58 and 55 percent, respectively--are privately owned.

Of the publicly-owned forest land, the largest acreage is revested Oregon and California railroad grant lands under Federal administration. These lands total approximately 47 thousand acres and support a merchantable timber volume of 597 million board feet. Since they include the odd-numbered sections in a township they lie in an alternate pattern with both private holdings and those in other forms of public ownership.

State-owned lands total approximately 13 thousand acres. The largest concentration, approximately 5 thousand acres, is in the McDonald Forest and Peavy Arboretum which lie some 5 miles north of Corvallis and serve as a field laboratory for the school of forestry at Oregon State College. The remainder of the State-owned acreage is in small scattered tracts in several townships.

National forest lands, a part of the Siuslaw National Forest, total about 10 thousand acres. Nearly all of this acreage is concentrated in the vicinity of Marys Peak; a few small areas lie along the southern boundary of the county. The national forest lands in the Marys Peak region together with some $2\frac{1}{2}$ thousand acres of municipally-owned tracts constitute the City of Corvallis watershed.

The acreage of county-owned and federally-owned public domain lands, totaling about 6 thousand acres each, is comprised of small isolated areas.

Forest Industry

Although definitely not large scale as thought of in the Douglas-fir region, the forest industry of Benton County has been fairly stable. During the 15-year period 1925-39, when sawlog production averaged approximately 74 million board feet annually, peak of production reached in 1937 was 59 percent greater than the average and the low point in production, in 1933, was 41 percent under the average.

In 1940 the sawmill industry in the county consisted of 21 active and 2 idle mills. The active mills had a total combined 8-hour capacity of approximately 500 thousand board feet. Only one mill had a capacity greater than 100 thousand board feet and another slightly in excess of 50 thousand board feet. The remainder, chiefly of a semi-portable type and equipped to cut only second-growth logs of relatively small diameter, had capacities of less than 50 thousand board feet. Several of the mills are owned and operated by farmers during the slack seasons.

Like the mills which they supply most of the logging operations in the county are of small capacity.

Bureau of the Census statistics for 1930 show 20 percent of the gainfully employed in the county directly engaged in the forest industries.

Forest Growth

The rate at which the timber volume of the county is being replaced through growth was computed on the basis of data obtained in the original inventory.

At that time the area of growing stock, less than 160 years in age and putting on net increment, totaled 123,580 acres of which 121,190 acres was stocked by immature Douglas-fir types and the remainder by hardwoods.

The current annual net volume growth on trees 15.1 inches or more d.b.h. was computed to be a little over 19 million board feet and approximately 10 million cubic feet on trees 5.1 inches or more d.b.h. Ninety-five percent of the board-foot growth was being put on by the large second-growth (type 8) stands.

Potentially the forest lands of the county are capable of producing an annual net volume of growth several times greater than the current growth rate. It was computed that if all of the forest land in the county were stocked with growing stands and producing at 75 percent of capacity the annual net growth would amount to approximately 105 million board feet.

Comparison of Inventories

Although only about 8 years elapsed between inventories, some idea of the current trends in timber supply, rate of depletion, and rate of growth can be obtained from a comparison of the results of the two inventories. The following tabulation shows this comparison:

	1932 inventory	1940 inventory	Change
Forest land area	224 M acres	238 M acres	+6%
Saw-timber stands	108 M acres	92 M acres	-15%
Conifer second growth 6-20" d.b.h.	46 M acres	67 M acres	+45%
Conifer second growth 0-6" d.b.h.	23 M acres	16 M acres	-30%
Saw-timber volume	3,136 million bd. ft.	2,492 million bd. ft.	-21%
Douglas-fir volume all sizes	2,909 million bd. ft.	2,341 million bd. ft.	-20%
Douglas-fir volume large old growth	1,125 million bd. ft.	821 million bd. ft.	-27%

The increase in forest land acreage was due to more intensive mapping of cut-over and burned-over areas utilized for grazing. A large acreage of the deforested lands is grazed at some time of the year to a varying degree and it was difficult, at the time of the original inventory, to draw the line between forest lands and those in agricultural use. In the reinventory, a considerable acreage of the stump land originally classed as agricultural was found to be not intensively managed for grazing and was therefore classified as forest land. In general, stump land and burned-over areas that were a part of a farm unit or that had been seeded to grass were classified as agricultural lands; all other areas of this character were classified as forest lands.

The decrease in the acreage of saw-timber stands as a whole was not great but the decrease in area of large old-growth Douglas-fir stands amounted to approximately 37 percent. Reduction in area of small old-growth (type 7) and large second-growth (type 8) Douglas-fir stands was approximately 13 and 8 percent, respectively. These percentages indicate that the overmature and more defective timber is being cut at a considerably greater rate than the thriftily growing timber. It is to be hoped that this trend will continue since many of the second-growth saw-timber stands in the county are near the age of maximum board-foot volume increment and their premature cutting would be an economic loss.

The substantial increase in area of conifer second growth 6-20" d.b.h. resulted from the passing of the stands mapped in the original inventory as seedlings and saplings into pole-sized stands. This relatively large acreage of pole-sized timber is one of the brighter spots in the county's forest situation. These together with the older second-growth stands of saw timber comprise a fair-sized backlog of future timber supplies.

The small acreage of seedling and sapling stands clearly points to one of the weak spots in the forest situation--the failure of a large part of the acreage logged since 1920 and most of the burned-over areas to restock. The lack of reproduction on many of these areas is due to recurring fires. All deforested areas in the county should be carefully classified according to the most productive use and areas classified as reforestation land should be given adequate fire protection. On a large number of the areas, particularly the old burns, advance growth of fern and brush prevents natural restocking by conifers.

The remaining volume of saw timber is considerably below the volume of normal growing stock that could be produced on the forest lands of the county. Assuming the 229 thousand acres of commercial conifer land, which averages site quality class III in productivity, were stocked to 75 percent of normality and managed on a 150-year rotation, the volume is calculated at approximately 4,000 million board feet. Thus, the present conifer volume of 2,474 million board feet is approximately 62 percent of this calculated figure.

Conclusions

Benton County's supply of saw timber, particularly of old growth, is becoming limited and remaining stands are both small in extent and quite widely scattered throughout the forest zone. In addition, individual holdings of saw timber are relatively small. These factors make it improbable that the forest industry in the county will be greatly expanded. The present industry consists of a large number of sawmills of small capacity supplied by equally small logging operations. Several of the mills are of a semi-portable type owned and operated by farmers.

The forest cover and ownership patterns in the forest zone of Benton County, both of which are intermingled to an unusual degree, suggest a future management plan involving relatively small sustained yield units made up of both private and public timber. Plans for putting the Federal, State, and municipal timberlands under sustained yield management are in the process of being drafted and these units will no doubt include much of the private timber. Some of the units will probably be operated in connection with farming and opportunity for farm-forestry projects will no doubt increase.

The hardwood stands, most of which are in the agricultural zone, particularly offer opportunities for the growing of forest crops on farm units.

Approximately 55 percent of the forest land is now stocked with immature stands and, if the large acreage of nonrestocked cut-over and burned-over lands could again be made productive, prospects of sustaining a forest industry approaching the present capacity would be fairly bright.

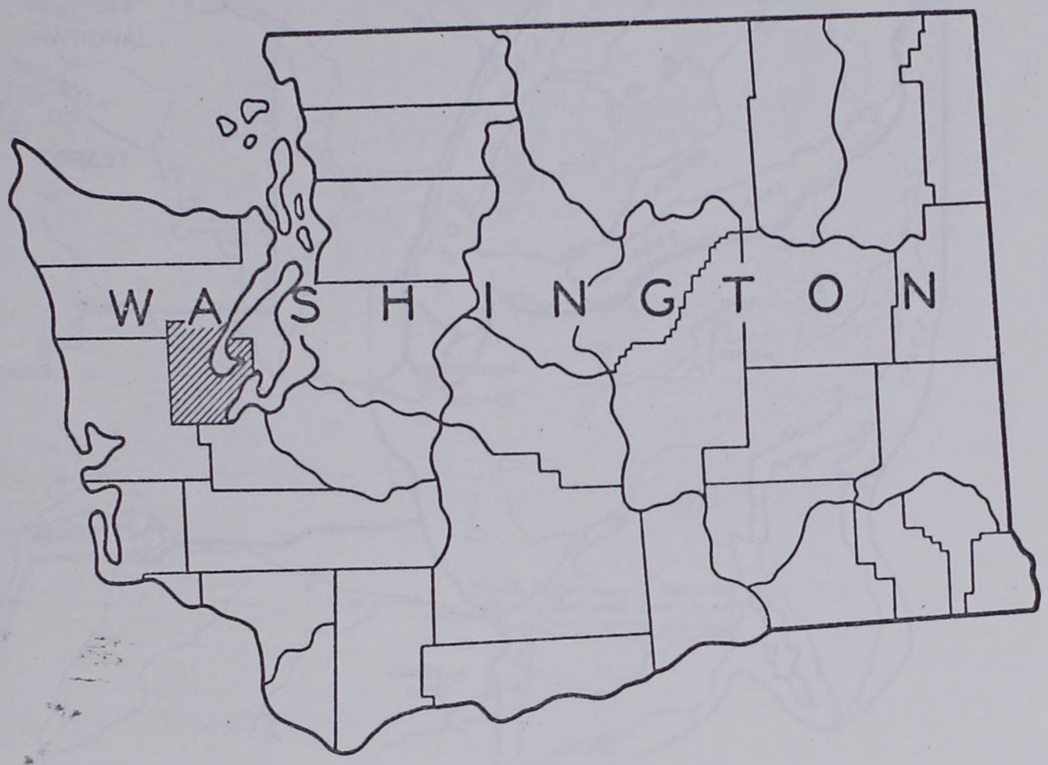
250 FORESTRY BUILDING
UNIVERSITY OF CALIFORNIA
BERKELEY

UNIVERSITY OF CALIFORNIA
BERKELEY

FOREST STATISTICS
FOR
MASON COUNTY, WASHINGTON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1940

FOREST SURVEY REPORT NO. 86



U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
STEPHEN N. WYCKOFF, DIRECTOR

R.W. COWLIN, IN CHARGE OF FOREST SURVEY F.L. MORAVETS, ASSISTANT

PORTLAND, OREGON

AUGUST 20, 1941

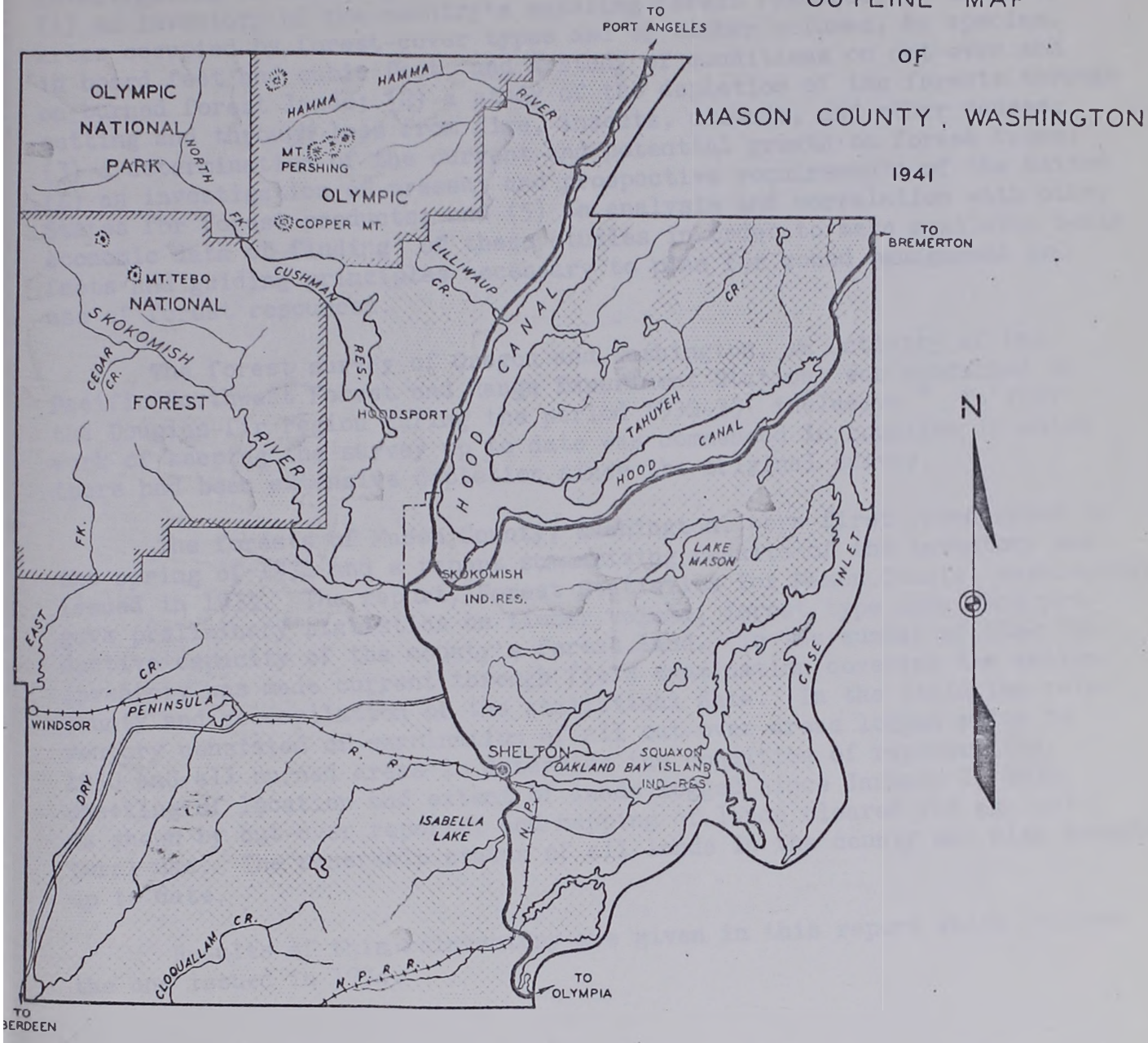
FIGURE 1.

OUTLINE MAP

OF

MASON COUNTY, WASHINGTON

1941



SCALE

0 5 10 15 MILES

LEGEND

SAW TIMBER

DEFORESTED CUTOVERS AND BURNS

SECOND GROWTH

NONCOMMERCIAL FORESTS AND NONFOREST LAND

FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and of timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of finding of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33, inclusive.* In 1937 work of keeping the survey up to date was commenced in counties in which there had been extensive depletion since the original survey.

The forests of Mason County, Washington, were first inventoried in the spring of 1932 and a report summarizing results of the inventory was issued in 1934. The report, Forest Statistics for Mason County, Washington, gave preliminary statistics on timber volume, forest type area, and productive capacity of the county's forest land. In the summer of 1940 the inventory was made current through field examination covering the entire county and recompilation of the statistical data. In the field the reinventory consisted of examination of all cut-over areas logged prior to 1930 and all burned areas to determine the condition of regeneration, checking of location and extent of lands logged since January 1, 1930, as shown by cut-over reports, and mapping of lands cleared for agricultural use. The ownership status of all lands in the county was also brought up to date.

Results of this reinventory are given in this report which follows the one issued in 1934.

* Oregon and Washington were divided for survey purposes into two regions, (1) Douglas-fir region, consisting of that part of both States west of the Cascade Range summit, and (2) ponderosa pine region, that part of both States east of the Cascade Range summit. A regional report which includes an interpretation of the forest-survey data and analysis of the forest situation in the Douglas-fir region has been published and a similar report for the ponderosa pine region is now in the process of being published. Each region was divided into units--11 in the Douglas-fir region and 7 in the ponderosa pine region--for the purpose of more intensive analysis of data. It is planned to issue reports presenting findings for each unit.

FOREST STATISTICS FOR MASON COUNTY, WASHINGTON

Contents

	Page
Introduction	1
The original forest	1
The present forest	2
Conifer saw timber	3
Conifer second growth	7
Recent cut-over areas	9
Nonrestocked cut-over and burned areas	9
Hardwoods	10
Noncommercial areas	10
Forest site quality	11
Nonforest land	11
Lands in agricultural use	11
Other nonforest land	11
Saw-timber volume	13
Utilization of the forest resource	13
Other depletion	16
Forest growth	16
Comparison of inventories	17
Summary of situation	19

Figures

1. Outline map of Mason County, Washington	Inside cover
2. Generalized forest types by ownership class	7
3. Distribution of saw-timber volume by species group	15

Tables

1. Area, in acres, of all forest cover types, by ownership class	4
2. Area, in acres, of generalized forest types, by ownership class	6
3. Area, in acres, of certain immature conifer forest types, by age class and degree of stocking	8
4. Land areas, forest land areas, and commercial conifer areas, by site quality class	12
5. Volume of timber by species and ownership class	14

FOREST STATISTICS FOR MASON COUNTY, WASHINGTON[1]

By F. L. Moravets[2]

The forests of Mason County, Washington, have constituted one of the most accessible sources of raw material for the huge lumbering industry of the Puget Sound district. Located near the southern portion of the Sound, all parts of the county are within 22 miles of tidewater. Continuous saw-timber stands of Douglas-fir, easy accessibility, and favorable topography resulted in logging on a large scale, particularly in the last two decades. Early statistics on sawlog production are not available, but those compiled by the Forest Service in cooperation with the Bureau of the Census since 1924 show a total cut of 3.5 billion board feet in the county during the 16-year period ending in 1940.

What has been the effect of harvesting operations of these proportions on the extent and character of the forest resource of the county? The answer is to be found in an analysis of the statistical data obtained in the original inventory of the county's forests in 1932 and the reinventory in 1940.

The Original Forest

Although the extent and character of the original forest that clothed the county is somewhat a matter of conjecture, the present forest type pattern indicates that prior to white settlement and logging, conifer timber of saw-timber size (about 20 inches and more d.b.h.) undoubtedly reached from the tideflats on Puget Sound to the barrens on the higher peaks and ridges of the Olympic Mountains in the northwestern portion of the county. Only a few immature stands of any extent broke up this continuity. Other breaks in the conifer cover occurred along stream courses where the alluvial bottomlands were occupied by pure hardwood stands, on swampy areas too poorly drained to permit tree growth, and on dry gravelly flats.

Physical factors which influence the occurrence of the tree species indigenous to the region are fairly uniform over a large part of the county. The topography of most of the county's surface is gentle. Bordering Puget Sound it is rolling; farther inland it becomes more level and a large part of the west-central portion is a slightly rolling upland

---

1/ Assistance in the compilation of the data contained in this report was furnished by the personnel of Work Projects Administration official project 65-2-94-144.

2/ Field work of the revised inventory of the county's forest resources was done by D. L. Lynch; compilation of data was done by Edna L. Hunt, T. J. Rowe, and W. E. Zeuthen.

plateau. Much of this gentle topography is mantled with deposits of glacial drift composed principally of sand and gravel of varying textures and depths. Large areas of this coarse-textured soil are underlaid with hardpan. Lying in the lee of the Olympic Mountains and influenced by the waters of the Sound, the climate of this portion of the county is temperate and oceanic in character. Annual precipitation averages about 50 inches. However, the rainfall is seasonal with the bulk of it occurring from November to May and very little during the summer months. This particular combination of physical factors produces a site that favors the growth of Douglas-fir and this species originally comprised from 75 to 100 percent of the stands stocking this portion of the county. In the southern portion a relatively low but rough range of hills, known as the Black Hills, trends east and west. Here, too, the predominant forest cover was Douglas-fir. In the rugged mountainous northwestern portion of the county, which rises from low foothills to high peaks of the Olympic Mountains, Douglas-fir extended up to an elevation of from 2,500 to 3,000 feet, depending on exposure. Above this elevation and in a zone in which the climate is less temperate and characterized by heavy precipitation, averaging well over 100 inches annually, there was a belt of mixed stands; first, those in which western hemlock was the key tree, and higher up the slopes and extending to the subalpine timber zone the upper-slope type comprised of varying mixtures of such species as Pacific silver fir, mountain hemlock, western hemlock, western white pine, and Alaska yellow-cedar.

The character of the soil over the vast bulk of the lower-lying portion of the county is such that the timber-producing capacity of the site averages relatively low. As a result the Douglas-fir produced here was a slow-growth type of timber considerably smaller in diameter than the average fir timber grown in the Douglas-fir region of western Washington and western Oregon. Although of average quality, it was inferior to the large old-growth fir of the region.

The Present Forest

After nearly a century of settlement and logging more than 95 percent of the county's land area of 612,270 acres is still forest land. Only about 3 percent is in agricultural use, either cultivated or stump pasture, and less than 2 percent is nonforest other than agricultural, a classification that includes mountain barrens, tidelands, town sites, swamps, and unmeandered water. However, in figure 1, which shows in a generalized way the present cover pattern, it is seen that the once almost continuous timber stand now occupies roughly about a fourth of the county's area. A detailed forest type map,[3/] one of the results of the

---

3/ One-inch-to-the-mile county type maps and $\frac{1}{4}$-inch-to-the-mile lithographed State type maps have been prepared to show the location and extent of the forest cover types. For information on them, address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland, Oreg.

forest survey, pictures much more clearly the extent and progress of logging operations across the county and the resultant creation of a variety of conditions ranging from recent cut-over land, nonrestocked older cut-over areas, areas restocked with second growth of varying age and density, to the remaining uncut stands. Table 1 shows statistically the distribution of the individual forest types by ownership class.

Conifer Saw Timber

The bulk of the remaining conifer timber of saw-timber size is concentrated in the northwest quarter of the county. Of the total of 149 thousand acres of this class of timber, occupying less than 26 percent of the county's forest land, 109 thousand acres is within the exterior boundaries of the Olympic National Forest and the Olympic National Park and most of the remainder lies just outside the national forest boundaries. In the progress of logging across the county occasional tracts of saw timber were left, but subsequent operations have reduced these to scattered stands of from 40 to 2,000 acres in extent. The greatest concentration of these small tracts is in the east-central part of the county south of Hood Canal.

On approximately 109.5 thousand acres, or 74 percent of the total saw-timber acreage in the county, the stands are composed principally of Douglas-fir, this species comprising from 60 to 100 percent of the merchantable volume in the stand.

On 34.4 thousand acres the majority of the volume is in large old-growth Douglas-fir more than 40 inches d.b.h. (type 6). As a rule, stands of this class of timber in the county are of fairly heavy stocking with an average volume per acre of about 50 thousand board feet. Most of the stands are from 400 to 600 years in age and the timber has considerable surface clear length. Defect is fairly low but, due to rough ground where the remaining stands are located, the breakage in falling will be high. This timber should cut a fairly high percentage of No. 1 logs. The larger bodies of this large old-growth Douglas-fir lie in the drainages of the Middle Fork Satsop River, the South Fork Skokomish River, and the North Fork Skokomish River above Cushman Reservoir. Most of the remaining acreage of this class of timber is in Federal ownership, table 1. Approximately 23.7 thousand acres is on national forest land available for cutting; an additional 1.1 thousand acres is in the national forest primitive area and reserved from cutting, and 3.7 thousand acres is in the Olympic National Park and reserved from cutting. Approximately 4.9 thousand acres is in private ownership.

Small old-growth Douglas-fir from 20 to 40 inches d.b.h. (type 7) stocks a total of 66.3 thousand acres. This class of timber was the predominant type over most of the county, the product of a site relatively low in productivity. Samples taken in this type during the survey show the trees to average about 34 inches d.b.h. and the stands to vary from 20 to 50 thousand board feet per acre. On a whole the timber is sound

Table 1.-Area, in acres, of all forest cover types, by ownership class
Data corrected to August 15, 1940

Type no.	Type	Private	State[1]	County	Municipal[2]	Indian	Federal				Total
							National forest		National park[2]	Other[3]	
							Available	Reserved			
	Douglas-fir										
6	Large old growth	4,905	890	5	45		23,675	1,080	3,720	40	34,360
7	Small old growth	24,640	4,660	675	660		31,630	285	3,740	25	66,315
8	Large second growth	4,210	930	285			3,390	45			8,860
9	Small second growth	84,040	5,810	11,470	220	1,655	840			215	104,250
10	Seedlings and saplings	102,080	13,060	30,445	1,900	1,870	3,450	120	735	350	154,010
	Western hemlock										
14	Large	155	125				18,725	2,475	4,245		25,725
15	Small	545	45	20			880	75	5		1,570
16	Seedlings and saplings		75								75
	Western redcedar										
17	Large	255			30		400		40		725
19	Small	120									120
23	Fir-mountain hemlock, large						3,130	1,050	8,420		12,600
26	Lodgepole pine, small	2,105	550	240						25	2,920
	Hardwood										
31.5	Large	6,260	345	540		485					7,630
31	Small	4,985	20	135		465			40		5,645
33	Subalpine						4,280	9,325	10,970		24,575
	Nonrestocked cutover										
35	Cut prior to 1920	8,620	390	2,525		60				60	11,655
35A	Cut from 1920-29, incl.	25,315	7,335	7,175			425				40,250
36	Recent cutover, since 1930	49,425	6,355	2,875	325	40	4,600			70	63,690
37	Deforested burn	390	65	105	45		4,295	4,005	1,640		10,545
38	Noncommercial rocky area						4,480	1,045	985		6,510
	Total forest types	318,050	40,655	56,495	3,225	4,575	104,200	19,505	34,540	785	582,030
	Nonforest land										
3	In agricultural use	17,715	75	20	95	540					18,445
2	Other	4,385	320	370		175	370	4,885	1,290		11,795
	Total	340,150	41,050	56,885	3,320	5,290	104,570	24,390	35,830	785	612,270

1/ Available for cutting. 2/ Reserved from cutting. 3/ Includes 665 acres available for cutting and 120 acres reserved from cutting.

and has considerable surface clear but will cut few No. 1 logs. Nearly all of the scattered tracts of saw timber in the lower-lying portion of the county are stocked with this type. Two large continuous bodies of this class of timber remain--one of about 16 thousand acres lies between the South Fork Skokomish River and Cushman Reservoir, and the other of slightly less acreage is south of the South Fork Skokomish River and east of the Satsop River drainage. Approximately 24.6 thousand acres of the type is in private ownership; 4.7 thousand acres is owned by the State; 31.9 thousand acres is national forest land, nearly all available for cutting; and about 3.7 thousand acres is in the national park.

Slightly less than 8.9 thousand acres is stocked with second-growth Douglas-fir saw timber from 20 to 40 inches d.b.h. (type 8). The timber in this type is less than 200 years of age, sound in quality, but usually coarse-grained. About three-fifths of the acreage of the type is in small scattered tracts in the eastern half of the county, principally in private ownership. The remainder is on national forest land chiefly in the Middle Fork Satsop River drainage.

The acreage of saw-timber stands in which western hemlock is the key tree (type 14) have been reduced very little by logging operations. All of the stands are located in the more inaccessible northwestern portion of the county. Practically all of the 25.7 thousand acres in this type is national forest and national park land. Stands of this type usually contain a mixture of western hemlock, Pacific silver fir, western redcedar, western white pine, and Alaska yellow-cedar. Timber of all of these species in the county is of average quality.

Higher up the slopes and even more inaccessible than the hemlock type occur the fir-mountain hemlock saw-timber stands (type 23) composed of varying mixtures of Pacific silver fir, mountain hemlock, western hemlock, Alaska yellow-cedar, and western white pine. All of the 12.6 thousand acres is in Federal ownership in the national forest and national park.

Western redcedar (type 17), the only other conifer saw-timber type in the county, has a total area of only 725 acres.

In table 2, which shows the area, in acres, of generalized forest types, by ownership class, summarized statistics on conifer saw timber in the county are given. A total of 34.2 thousand acres, or 23 percent of the total area, is in private ownership; 6.6 thousand acres, or about 5 percent, is owned by the State; and 106.1 thousand acres, or about 71 percent, is Federally owned. Saw timber on 81.0 thousand acres in Federal ownership is available for cutting.

Figure 2 graphically shows the extent of the saw-timber stands in relation to the other generalized forest types in the county and also the ratio of private to public ownership.

Table 2.-Area, in acres, of generalized forest types, by ownership class
Data corrected to August 15, 1940

Type definition	Private	State 1/	County	Municipal 2/	Indian	Federal				Total
						National forest		National park 2/	Other 3/	
						Available	Reserved			
Conifer saw timber Types 6, 7, 8, 14, 17, & 23	34,165	6,605	965	735		80,950	4,935	20,165	65	148,585
Conifer second growth Types 9, 15, and 19										
On cut-over areas	75,870	4,530	8,915	220	1,655				115	91,305
On old burns	8,835	1,325	2,575			1,720	75	5	100	14,635
Total	84,705	5,855	11,490	220	1,655	1,720	75	5	215	105,940
Conifer seedlings and saplings Types 10 and 16										
On cut-over areas	101,165	13,115	30,430	1,890	1,870	3,185	60		350	152,065
On old burns	915	20	15	10		265	60	735		2,020
Total	102,080	13,135	30,445	1,900	1,870	3,450	120	735	350	154,085
Recent cut-over areas Type 36	49,425	6,355	2,875	325	40	4,600			70	63,690
Nonrestocked cut-over and burned areas Types 35, 35A, and 37	34,325	7,790	9,805	45	60	4,720	4,005	1,640	60	62,450
Hardwoods Types 31 and 31.5	11,245	365	675		950			40		13,275
Noncommercial areas Types 26, 33, & 38	2,105	550	240			8,760	10,370	11,955	25	34,005
Total forest types	318,050	40,655	56,495	3,225	4,575	104,200	19,505	34,540	785	582,030
Nonforest land Types 2 and 3	22,100	395	390	95	715	370	4,885	1,290		30,240
Total	340,150	41,050	56,885	3,320	5,290	104,570	24,390	35,830	785	612,270

1/ Available for cutting. 2/ Reserved from cutting. 3/ Includes 665 acres available for cutting and 120 acres reserved from cutting.

Conifer Second Growth

Figure 1 discloses that a large part of the county is stocked with second growth. In the southern half, in particular, young conifer stands extend for miles in practically unbroken cover. Study of the type area statistics shows that a total of 260 thousand acres or approximately 45 percent of the total forest land in the county is stocked with

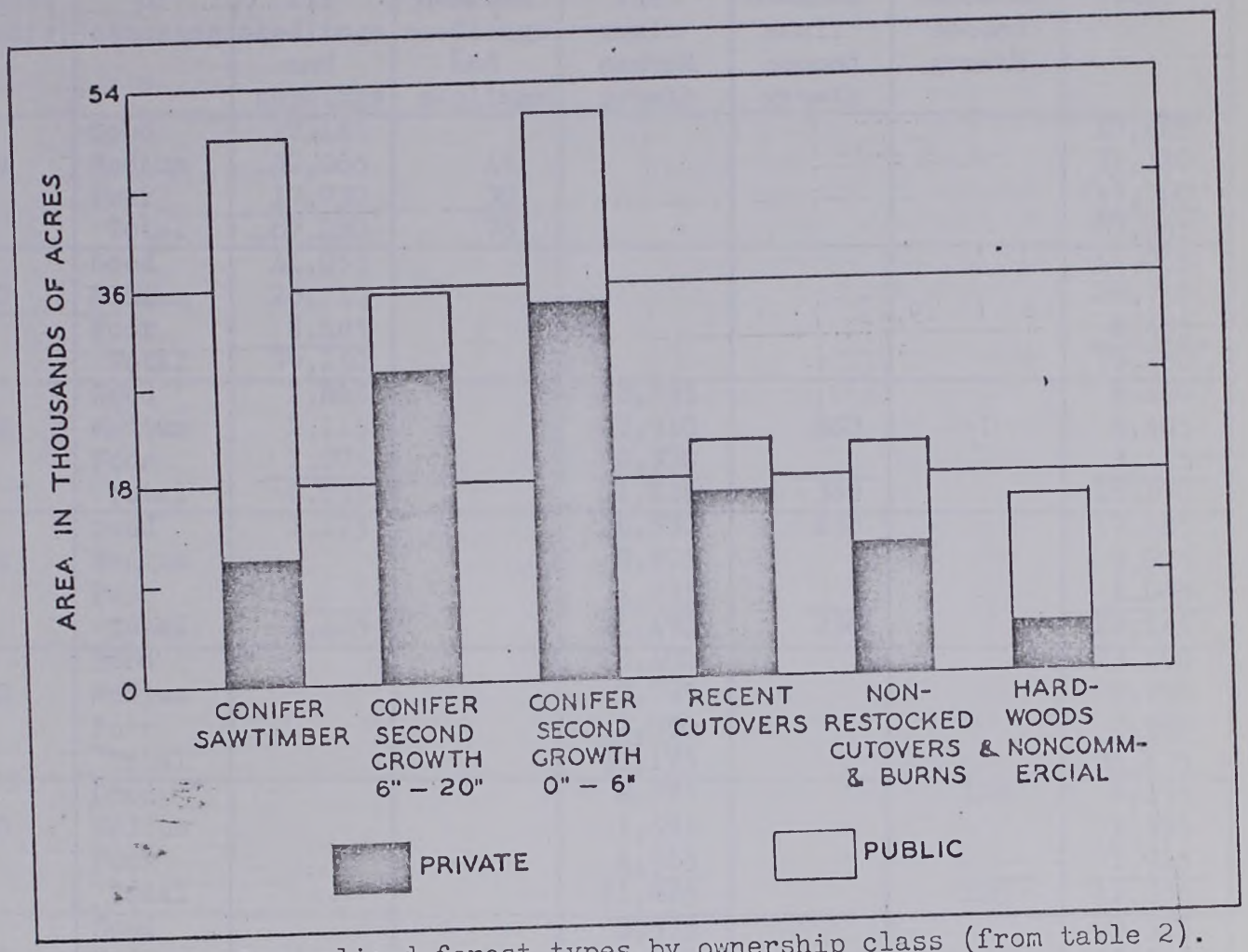


Figure 2. Generalized forest types by ownership class (from table 2).

conifer second-growth timber from 0 to 20 inches d.b.h. Also, in table 3, which shows the area, in acres, of certain immature conifer forest types, by age class and degree of stocking, it is seen that on 124.5 thousand acres, or 48 percent of the total second-growth conifer area, the stands are well stocked, on 93.1 thousand acres, or 36 percent, they are of medium stocking, and are poorly stocked on 42.4 thousand acres, or 16 percent. These figures indicate a density of stocking considerably higher than the average for the Douglas-fir region. Unfortunately, early prospects of future crops of saw timber from these immature stands are somewhat less promising than these statistics would seem to indicate. Approximately

Table 3.-Area, in acres, of certain immature conifer forest types, by age class and degree of stocking

Data corrected to August 15, 1940

Age class (years)	Degree of stocking	Type number and name: 10 Douglas-fir seedlings and saplings	16 Western hemlock seedlings and saplings	9 Douglas-fir small second growth	15 Western hemlock small second growth	19 Western redcedar second growth	Total
10	Good	17,485					17,485
	Medium	32,065	45				32,110
	Poor	17,730	30				17,760
	Total	67,280	75				67,355
20	Good	44,055					44,055
	Medium	26,710					26,710
	Poor	8,485					8,485
	Total	79,250					79,250
30	Good	2,865		5,555			8,420
	Medium	2,115		3,910	380		6,405
	Poor	1,075		2,370			3,445
	Total	6,055		11,835	380		18,270
40	Good	1,425		15,530	230		17,185
	Medium			9,925			9,925
	Poor			1,035			1,035
	Total	1,425		26,490	230		28,145
50	Good			23,400			23,400
	Medium			7,795			7,795
	Poor			2,980			2,980
	Total			34,175			34,175
60	Good			8,375		120	8,495
	Medium			1,595			1,595
	Poor			1,915			1,915
	Total			11,885		120	12,005
70	Good			3,375			3,375
	Medium			3,610			3,610
	Poor			3,910			3,910
	Total			10,895			10,895
80	Good			1,195			1,195
	Medium			1,530	95		1,625
	Poor			905			905
	Total			3,630	95		3,725
90+	Good			880			880
	Medium			2,435	865		3,300
	Poor			2,025			2,025
	Total			5,340	865		6,205
Total all ages	Good	65,830		58,310	230	120	124,490
	Medium	60,890	45	30,800	1,340		93,075
	Poor	27,290	30	15,140			42,460
	Total	154,010	75	104,250	1,570	120	260,025

56 percent of the total area of second-growth conifer stands is stocked with trees in the 10- and 20-year age classes, and 87 percent with trees less than 55 years of age. Also, on a considerable acreage the more densely stocked stands are in such a stagnated condition that they are putting on very little growth. This is particularly true in the central and northeastern portions of the county where the site, due to the gravelly character of the soil and often poor subsurface drainage, is low in productivity. The most thrifty stands of second growth are found in the southern portion of the county where the quality of the site averages considerably higher.

Like the original stands that stocked the county, the second-growth stands are preponderantly Douglas-fir. On all but about 1 percent of the total restocked area, Douglas-fir comprises 60 percent or more of the number of stems in the stand and many of the stands are composed entirely of this species. Stands in which immature western hemlock is the key tree are found almost entirely in the mountainous northwestern portion of the county.

Another rather significant fact regarding the second-growth stands is the large percentage of the area occupied by them that is restocked cut-over land. Only about 6 percent of the area is restocked burns.

The older second-growth stands occur principally in the eastern portion of the county along tidewater where logging operations began.

Recent Cut-Over Areas

Areas clear cut since January 1, 1930, total 63.7 thousand acres, or about 11 percent of the county's forest land. The largest areas of this type are on Kitsap Peninsula in the elbow of Hood Canal and in the lower drainages of the main and north forks of the Skokomish River. No examination of these lands to determine the condition of regeneration was made at the time of the reinventory. On some of the larger tracts seed supply may be inadequate, particularly on the Kitsap Peninsula where only small isolated fragments of the original stand remain. However, on the smaller tracts there is usually a seed source fairly close by.

Nonrestocked Cut-Over and Burned Areas

In this generalized group of types are included areas logged prior to 1920 that are nonrestocked, areas logged during the decade 1920-29 that are nonrestocked, and all nonrestocked burns regardless of date of the fire.

Areas logged prior to 1920 that are less than 10 percent restocked total 11.7 thousand acres. This acreage is comprised of several scattered areas of a few hundred acres in extent. None are more than 1,500 acres. Some of these areas are fairly near to seed supply and barring recurring fires, may restock in a comparatively short time. Other areas, surrounded

by seedling stands of Douglas-fir, will probably remain nonrestocked for a considerable number of years.

Examination during the reinventory of areas logged during the decade 1920-29 disclosed a total of 40.3 thousand acres nonrestocked. As data obtained in the original inventory show that approximately 100 thousand acres was cut over during the decade, results of this examination indicate that only 60 percent of this cut-over area had restocked by 1940. The nonrestocked acreage is made up of a few fairly large tracts and several small ones. The largest solid tract of this type, located in the southwestern part of the county, contains about 7 thousand acres, and on two sides adjoins Douglas-fir second growth approximately 40 years in age.

Deforested burns total about 10.5 thousand acres. Nearly all of this acreage is on rocky slopes and ridges adjacent to the subalpine timber zone.

Hardwoods

Hardwood stands cover a total of about 13.3 thousand acres of bottomlands and lower slopes. About a third of this acreage is along the lower Skokomish River; the remainder is in scattered tracts. The majority of the stands are of red alder; a few contain a mixture of alder and bigleaf maple; and there is a narrow stringer of northern black cottonwood along the Skokomish River. Trees on about three-fifths of the total hardwood acreage are of saw-timber size (12 inches and more d.b.h.).

Noncommercial Areas

Approximately 34 thousand acres of forest land supports timber which for one reason or another was considered to be of noncommercial quality.

Lodgepole pine stands in which the trees are less than 12 inches d.b.h. are found on about 2.9 thousand acres. This acreage is in several areas in the lower-lying central portion of the county. On these areas the quality of the site is too poor for the production of Douglas-fir.

The subalpine type extends over 24.6 thousand acres of the upper slopes and ridges in the mountainous national forest and national park. Stands in this type are composed of varying mixtures of mountain hemlock, Pacific silver fir, lodgepole pine, and western white pine. The timber is too short, limby, and rough to be of commercial quality.

Noncommercial rocky areas totaling about 6.5 thousand acres are located also in the national forest and national park. They lie below the subalpine zone but, because of the rocky character of the site or the steepness of the slope, the timber is either of poor form or quality or too inaccessible to be classified as commercial.

Forest Site Quality

All forest lands in the county considered capable of producing conifer timber of commercial quality were rated as to their site quality or productive capacity. Results of this classification are shown in table 4. On the basis of the original type a total of 494.8 thousand acres was rated according to the Douglas-fir site classification and 40 thousand acres by the spruce-hemlock site classification.

Under both classifications the forest lands of the county average low in productivity. Over one-half of the acreage rated on its ability to produce Douglas-fir was classed as site qualities IV and V, the next to poorest and poorest classes, and most of the remainder was site III, which is only of average productivity. The large acreage of the coarse gravelly soils of the central and northeastern portions of the county rate site class IV and the poorly drained areas as site class V. The better sites occur in the southern portion and in the lower foothills of the Olympic Mountains.

Nonforest Land

Lands in Agricultural Use

A total of 18.4 thousand acres was classified by the survey as being in agricultural use, either cultivated or stump-land pasture which was a part of a farm unit. Bureau of the Census statistics for 1940 show there were 769 farms in the county with a total acreage of 43,995 acres. This total was comprised of 6,234 acres of cropland, 2,842 acres of plowable pasture, 24,760 acres of woodland, and 10,159 acres of other land. The latter class includes some nonrestocked lands which were mapped in the survey as stump pasture. A comparison with statistics obtained in the 1930 census shows that the acreage in farms had increased about 12 percent but the number of farms had increased 70 percent. The average size of farm had decreased 33 percent.

Lands in agricultural use are not concentrated in any particular region but are widely scattered throughout much of the county. Some of the larger areas under cultivation are on the bottomlands along the lower Skokomish River. Many of the farms are near tidewater along the bays and inlets of Puget Sound.

Because of the character of the soil and the relatively high cost of clearing, the cut-over lands have not proven attractive for agricultural use. As the area of uncleared alluvial bottomland is limited, it is improbable that the acreage of cultivated land will be increased very greatly in the near future.

Other Nonforest Land

Lands in this category include high mountain barrens, swamps and

Table 4.-Land areas, forest land areas, and commercial conifer areas, by site quality class[1/]
Data corrected to August 15, 1940

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class I	3,275	0.5	0.6	0.6
Class II	37,760	6.2	6.5	7.1
Class III	199,225	32.5	34.2	37.2
Class IV	238,485	39.0	41.0	44.6
Class V	16,035	2.6	2.7	3.0
Total	494,780	80.8	85.0	92.5
Spruce-hemlock				
Class III	3,450	0.6	0.6	0.6
Class IV	20,600	3.4	3.6	3.9
Class V	15,920	2.6	2.7	3.0
Total	39,970	6.6	6.9	7.5
Total commercial conifer	534,750	87.4	91.9	100.0
Lodgepole pine	2,920	0.5	0.5	
Subalpine	24,575	4.0	4.2	
Noncommercial rocky	6,510	1.1	1.1	
Hardwood	13,275	2.1	2.3	
Total other	47,280	7.7	8.1	
All forest land	582,030	95.1	100.0	
Nonforest land	30,240	4.9		
Grand total	612,270	100.0		

1/ The "site quality" of a forest area is its relative productive capacity, determined by climatic, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for both Douglas-fir and spruce-hemlock types, Class I being the highest. In the survey Douglas-fir classifications were used for Douglas-fir and western redcedar types; spruce-hemlock classifications were used for Sitka spruce, western hemlock, and upper-slope types.

unmeandered water, tidelands and town sites. The greater part of the total of 11.8 thousand acres is in mountain barrens.

Saw-Timber Volume

The reinventory in 1940 showed a total merchantable saw-timber volume of 6,472 million board feet, log scale, Scribner rule. In table 5, which shows the volume of timber by species and ownership class, it is seen that 9 conifer and 3 hardwood species comprise this total. However, all but 24 million board feet is of conifer species.

Of the volume of Douglas-fir, which is 4,010 million board feet or approximately five-eighths of the total of all species, about 38 percent is large old growth more than 40 inches d.b.h.; 50 percent is small old growth from 20 to 40 inches d.b.h.; and 12 percent is second-growth timber 16 to 40 inches d.b.h.

The volume of western hemlock, the only other species of which there is an appreciable amount, is 1,424 million board feet.

Approximately three-fourths of the small volume of hardwood species is red alder.

Nonreserved timber totals 5,326 million board feet or about 82 percent of the total volume. Of this, 1,037 million board feet is privately owned, and the remainder is in public or Indian ownership. Of the publicly-owned available timber, 4,041 million is on national forest land. A little over three-fourths of the reserved timber volume is in the Olympic National Park; the remainder is in the national forest primitive area and on municipally-owned lands adjacent to Cushman Reservoir.

Under current economic conditions, it is probable that only about three-fifths of the nonreserved timber volume is available for profitable utilization.

Figure 3 shows the distribution of the saw-timber volume by species and broad ownership class.

Utilization of the Forest Resource

In the preceding analysis of type areas and timber volume statistics, it is seen that the major part of the county's original forest stand has been harvested. The logging of this large amount of timber and the milling of a considerable portion of it locally has provided the principal basis of the social and economic development of the county. Exploitation of the county's other natural resources such as water power, agricultural lands, and fisheries, although important, has been minor in comparison to the part played by exploitation of the forest resource.

Table 5.-Volume of timber by species and ownership class
Data corrected to August 15, 1940

Trees 16" and more d.b.h.[1]
Thousands of board feet, log scale, Scribner rule

Species	Private	State[2]	County	Municipal[3]	Indian	Federal				Total
						National forest		National park[3]	Other[2]	
						Available	Reserved			
Douglas-fir	216,734	60,797	2,117	10,216		1,026,533	40,970	150,671	64	1,508,102
Large old growth	464,999	70,554	5,345	22,291		1,273,830	18,475	170,482	149	2,026,125
Small old growth	76,326	34,165	3,683	1,064		109,647	9,931		50	234,866
Large second growth	180,074	28,841	15,316	2,350	410	13,888			171	241,050
Small second growth										
Sitka spruce	104									104
Large	47									47
Small										
Western hemlock	25,817	9,185	318	2,872		1,032,428	76,777	276,364	44	1,423,805
Large	8,846	1,732	169	507		190,326	13,806		8	215,394
Small						2,765	20	5,994		8,779
Mountain hemlock										
Western redcedar	36,130	8,179	377	4,343	70	168,247	11,314	76,545	2	305,207
Live	1,942					4,087	336	9		6,374
Dead						4,883	1,412	3,263		9,558
Alaska yellow-cedar	6,347	1,180	114	270		47,322	3,192	2,958	12	61,395
Western white pine	8					151,029	42,247	196,735		390,019
Pacific silver fir	463					15,103	900			16,466
Grand fir	15,282	1,228	1,134	75	905	10		32	7	18,673
Red alder	2,986	298	82	37	140	279		7	3	3,832
Bigleaf maple	791				35	1,103		6		1,935
Black cottonwood										
Total	1,036,896	216,159	28,655	44,025	1,560	4,041,480	219,380	883,066	510	6,471,731

1/ Trees of hardwood species taken from 12" and more d.b.h. 2/ Available for cutting. 3/ Reserved from cutting.

Although Bureau of the Census statistics for 1940 are not yet available, those for 1930 are perhaps more significant since they are nearer to the peak period of lumbering operations in the county, 1925-29. The statistics show that of the 4,393 persons employed in the county in 1930, 1,490, or 34 percent, were directly engaged in lumbering and allied industries. In the same year, 524 persons, or 12 percent of the total, were engaged in agriculture.

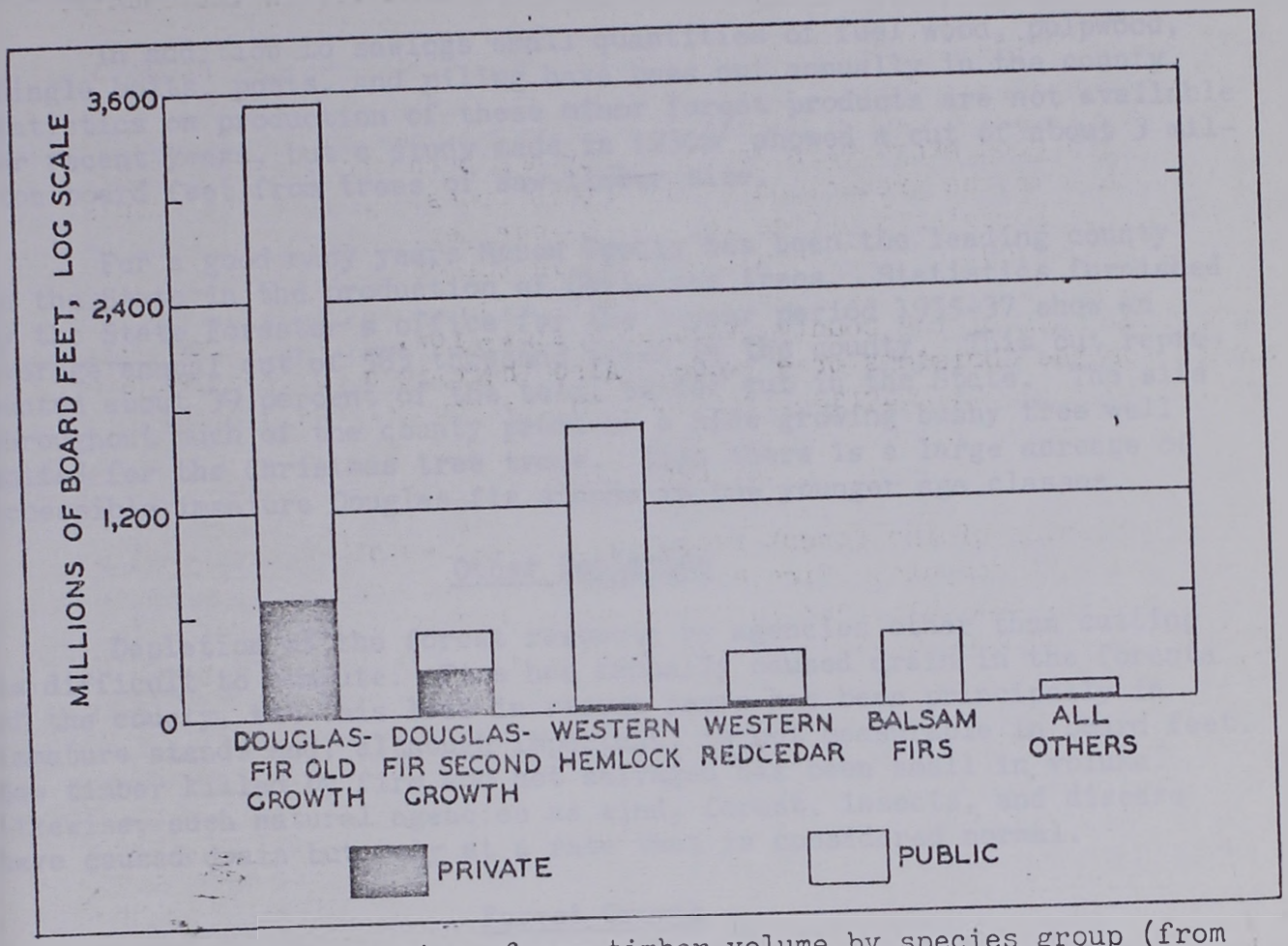


Figure 3. Distribution of saw-timber volume by species group (from table 5).

Statistics for sawlog production for the 16-year period 1925-40 show an average annual cut of 215 million board feet. Peak years during the period were 1928 and 1929 when more than 500 million board feet was cut in each of the two years. The cut dropped very materially during the depression period 1930-33, then increased steadily through 1937, dropped sharply in 1938, increased again in 1939 and exceeded the average cut for the 16-year period, but fell below the average again in 1940.

Large quantities of sawlogs have been shipped out of the county to other Puget Sound lumbering centers. On the other hand, the sawmills and the pulp mill in the county have imported logs from neighboring counties.

Sawmill capacity in the county has not varied greatly since 1925 although lumber production has fluctuated with general market conditions. In 1940 there were two fairly large mills and two small ones in operation. A pulp mill of a 24-hour capacity of 300 tons of bleached sulphite pulp is located at Shelton.

In addition to sawlogs small quantities of fuel wood, pulpwood, shingle bolts, posts, and piling have been cut annually in the county. Statistics on production of these minor forest products are not available for recent years, but a study made in 1930 4/ showed a cut of about 3 million board feet from trees of saw-timber size.

For a good many years Mason County has been the leading county in the State in the production of Christmas trees. Statistics furnished by the State Forester's office for the 3-year period 1935-37 show an average annual cut of 583 thousand trees in the county. This cut represented about 39 percent of the total number cut in the State. The site throughout much of the county produces a slow-growing bushy tree well suited for the Christmas tree trade. Also there is a large acreage of accessible immature Douglas-fir stands in the younger age classes.

Other Depletion

Depletion of the forest resource by agencies other than cutting is difficult to compute. Fire has annually caused drain in the forests of the county, but this loss in recent years has been principally in immature stands and, although important, is not measurable in board feet. Saw timber killed by fire and not salvaged has been small in volume. Likewise, such natural agencies as wind, forest, insects, and disease have caused drain but only at a rate that is considered normal.

Forest Growth

Offsetting in part the annual drain on the forests of the county due to cutting, fire, and natural enemies, the thrifty immature stands have been putting on increment.

In the survey it was assumed that the only stands putting on net increment were those less than about 160 years of age. Net increment in stands from 160 to about 300 years is thought to be offset by net loss due to mortality and decay in older stands. On this basis and using data obtained in the reinventory, the acreage of growing conifer stands on unreserved lands was found to be 266 thousand acres.

4/ Johnson, Herman M. The Production and Consumption of Minor Timber Products in Oregon and Washington. Office report, Pacific Northwest Forest Experiment Station.

On these unreserved growing stands, the current annual growth, or the annual increment of the stands in their present condition, was computed to be 9.6 million board feet in trees 15.1 inches and more d.b.h. estimated in 32-foot logs to a 12-inch top diameter inside bark. Assuming a more intensive utilization standard in which the minimum tree is 11.1 inches d.b.h. estimated in 16-foot logs to an 8-inch top diameter, the current annual growth was computed to be 45.5 million board feet.

Another calculation involving growth estimates is a computation of the annual cut allowable under sustained yield management. If one assumes a rotation period of 100 years for the forests of the county under management, the present unreserved mature timber volume in all ownerships of 4,638 million board feet would furnish an annual cut of about 46 million board feet. To this figure should be added the mean annual board-foot increment to rotation age of the present unreserved immature conifer stands of all ages. Roughly, these immature stands are stocked to about 70 percent of normal. Assuming this degree of stocking, the mean annual board-foot increment in all immature conifer trees 11.1 inches and more d.b.h. estimated in 16-foot logs to an 8-inch top diameter inside bark on unreserved lands would be approximately 64 million board feet. In this calculation the utilization standard is considerably more intensive than prevails in the county at present. However, it is assumed that when this second-growth timber is ready for cutting such a standard will prevail. The 64 million board feet of second growth added to the cut of 46 million board feet of mature timber would indicate a total annual allowable cut of 110 million board feet, only a little more than one-half of the volume of sawlogs produced annually in the county in recent years. Obviously, the continued harvesting of mature timber at a rate in excess of the allowable cut and any premature cutting of second-growth timber will very materially reduce future allowable annual cuts. Also, the allocation of the cut of mature timber assumes that all of it will be operable when scheduled for cutting. Actually some of it may prove unprofitable to log and the allowable cut would have to be decreased accordingly.

Comparison of Inventories

Considerable insight into the current forest situation in Mason County, as regards timber supply, rate of depletion, and rate of replenishment, can be obtained by comparing results of the original and revised inventories. Such a comparison follows:

	1932 inventory	1940 inventory	Change
Forest land area	578 M acres	582 M acres	+0.7%
Saw-timber stands	210 M acres	149 M acres	-29%
Conifer second growth 6-20" d.b.h.	83 M acres	106 M acres	+28%

Conifer second growth 0-6" d.b.h.	96 M acres	154 M acres	+60%
Privately-owned forest land	370 M acres	318 M acres	-14%
Privately-owned saw-timber stands	85 M acres	34 M acres	-60%
Saw-timber volume	7,902 million bd. ft.	6,471 million bd. ft.	-18%
Douglas-fir volume all sizes	5,273 million bd. ft.	4,010 million bd. ft.	-24%
Douglas-fir volume large old growth	1,912 million bd. ft.	1,508 million bd. ft.	-21%
Privately-owned saw-timber volume	2,261 million bd. ft.	1,037 million bd. ft.	-54%
Nonreserved saw-timber volume	7,968 million bd. ft.	5,326 million bd. ft.	-33%
Reserved saw-timber volume	34 million bd. ft.	1,146 million bd. ft.	+3,271%

The increase in forest land acreage was due chiefly to more intensive classification and mapping of nonforest land in the reinventory rather than a reclamation of nonforest land by forest growth.

In the interim between inventories, approximately 7½ years, the area of saw-timber stands was reduced 61 thousand acres or roughly at the rate of 8 thousand acres per year. On a percentage basis the annual reduction amounted to about 4 percent. The bulk of the cutting was in privately-owned stands; reduction of their acreage totaled 51 thousand acres, causing a decrease of 60 percent in the privately-owned acreage as of 1932. The decrease of publicly-owned saw-timber area was due in part to the reclassification, in the reinventory, of some of the stands on steep upper slopes in the national forest as noncommercial timber. The considerably smaller percentage of decrease in total saw-timber volume, 18 percent, against a decrease of 29 percent in saw-timber acreage indicates that during the period between inventories the stands that were cut were of less volume per acre than the present remaining stands. Comparison of the original detailed forest type map with the revised map bears out this fact since it shows that most of the cutting during the period was of stands on the poorer sites and also of small residual stands that were passed up in the first sweep of logging across the county. A considerable part of the remaining saw-timber acreage is stocked with stands of timber heavier in volume and better in quality than the stands that

have been logged. The smaller decrease in volume of large old-growth Douglas-fir than in volume of this species of all sizes also substantiates the explanation, since the reduction of stands of this most desirable class of fir was only about 5 thousand acres.

The increase of 23 thousand acres in area of conifer second growth, 6-20 inches d.b.h., was the result of the transition of sapling stands to small pole stands.

The 60 percent increase in conifer second growth, 0-6 inches d.b.h., was the result of regeneration of areas logged during the decade 1920-29, which were classified as recent cut-over land in the original inventory, and to the restocking of 13 thousand acres logged prior to 1920, that were nonrestocked in 1932.

Creation of the Olympic National Park in 1940 and the Olympic Primitive Area in 1936 placed 883 million board feet and 219 million board feet, respectively, into a reserved-from-cutting status.

Summary of Situation

The major portion of the more accessible timber in the county has been harvested and remaining stands lie principally in the rough mountainous northwestern portion of the county. Since a large part of the acreage of these stands is in national-forest ownership, the timber will be harvested under sustained-yield management. It is, of course, desirable that the private and State saw timber intermingled with that Federally owned will be managed similarly.

Scattered stands of saw timber, chiefly small old-growth Douglas-fir, remaining in the eastern and southern portions of the county are accessible and will no doubt be heavily cut during the present increased activity in lumbering operations.

Annual depletion due to cutting has averaged about 190 million board feet during the last 5 years but a very material drop in annual cut of sawlogs in the county in the next decade is inevitable. As the present sawmills and pulp plant are located on tidewater, they are not dependent on local timber but may continue to operate for some time, principally on logs obtained from nearby Puget Sound log markets. A substantial decrease in logging operations is certain to seriously affect the economy of the county since this industry has been one of the principal employers of labor. Unfortunately, any expansion in the exploitation of the other natural resources cannot be expected to materially offset the effect of curtailment of the lumbering industry.

The 260 thousand acres of second-growth timber in the county is encouraging, but the fact that 87 percent of this acreage is stocked with stands in the 10- to 50-year age classes and that most of the stands are on sites of low productive capacity does not promise early

future crops of sawlogs. However, the cutting of Christmas trees from second-growth stands brings in an early revenue and, if properly managed, it is probable that on the poorer sites the growing of this product will be more profitable than the production of saw timber. Many of the stands would materially benefit from thinning and in some cases such thinnings would furnish Christmas trees. Naturally, the better trees are obtained from stands that are not too densely stocked.

Because of the rather limited amount of second-growth timber from 16-20 inches d.b.h. and the relative inaccessibility of some of the type 8 stands (timber 20 to 40 inches d.b.h.), the premature cutting of this class of timber has not been a serious problem.

The 62 thousand acres of nonrestocked cut-over and burned areas constitutes a serious problem of idle land which will not be readily solved. Satisfactory restocking of this acreage would materially help in reducing the large disparity between current and potential growth rates.

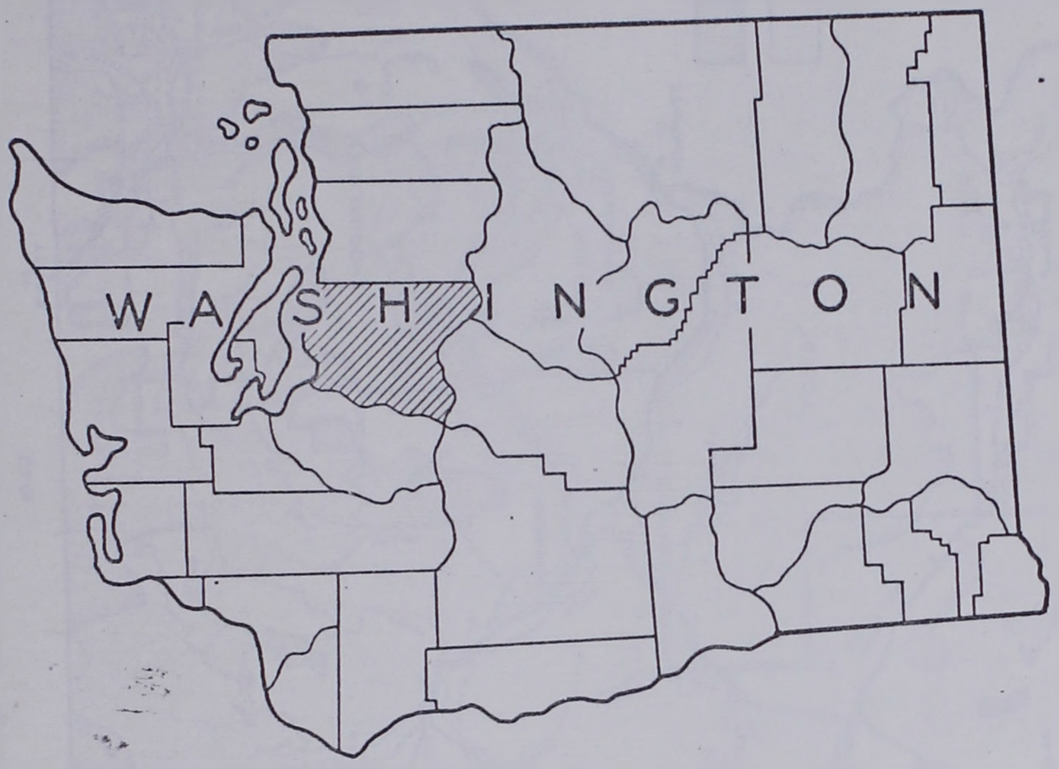
FORESTRY LIBRARY
260 FORESTRY BUILDING
UNIVERSITY OF CALIFORNIA
BERKELEY

FORESTRY LIBRARY
251 GIANNINI HALL
UNIVERSITY OF CALIFORNIA
BERKELEY

FOREST STATISTICS
FOR
KING COUNTY, WASHINGTON

FROM THE FOREST SURVEY INVENTORY REVISED IN 1941

FOREST SURVEY REPORT NO. 87



U.S. DEPARTMENT OF AGRICULTURE — U.S. FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
STEPHEN N. WYCKOFF, DIRECTOR

R.W. COWLIN, IN CHARGE OF FOREST SURVEY — F.L. MORAVETS, ASSISTANT

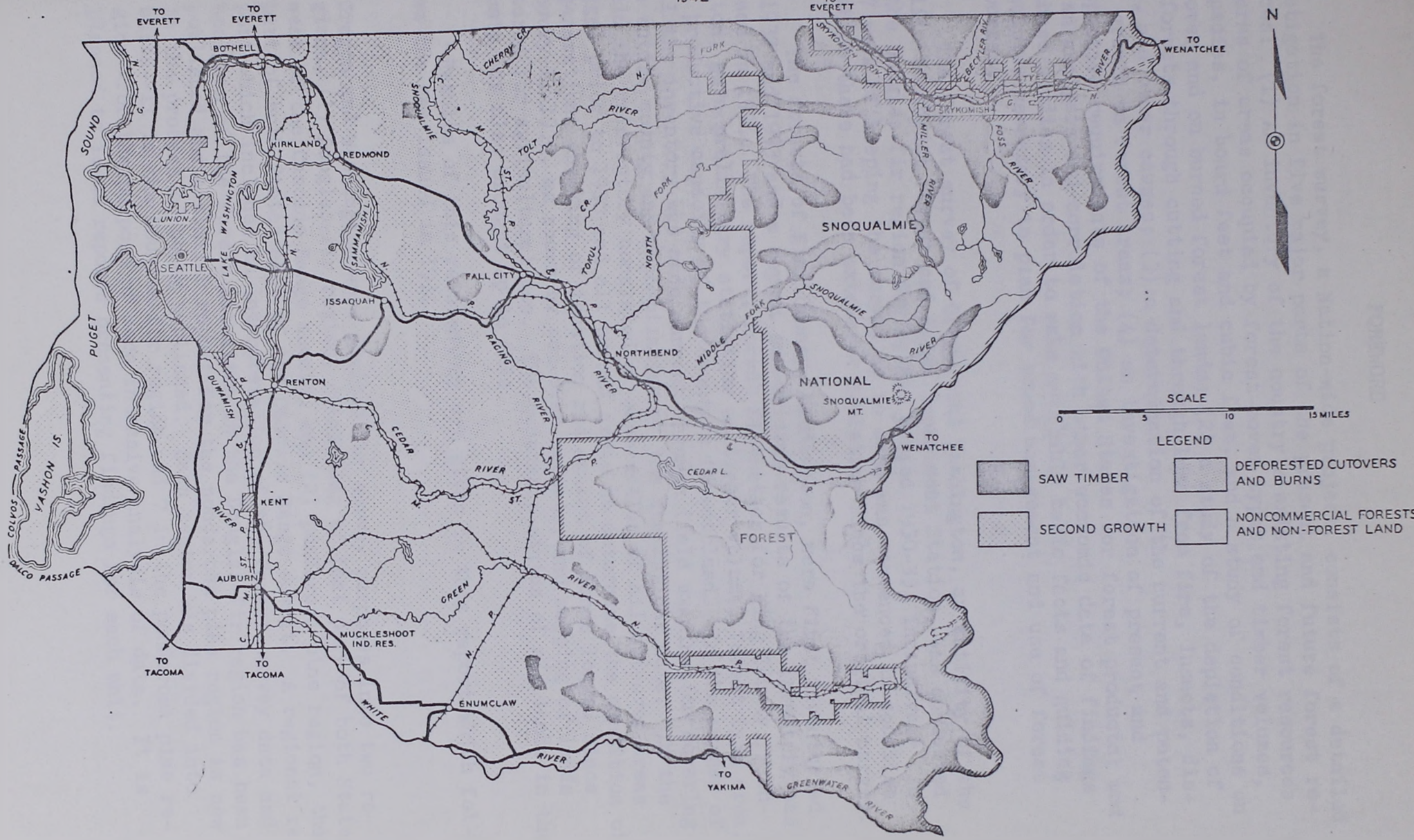
PORTLAND, OREGON

APRIL 25, 1942

FIGURE 1

OUTLINE MAP OF KING COUNTY, WASHINGTON

1942



FOREWORD

The forest survey, a Nation-wide project, consists of a detailed investigation in five major parts of the present and future forest resources: (1) An inventory of the country's existing forest resources in terms of areas occupied by forest-cover types and timber volumes, by species, in board feet and cubic feet, and a study of conditions on cut-over and on burned forest lands; (2) a study of the depletion of the forests through cutting and through loss from fire, insects, disease, and other causes; (3) a determination of the current and potential growth on forest areas; (4) an investigation of present and prospective requirements of the United States for forest products; and (5) an analysis and correlation with other economic data of findings of these studies in order to make available basic facts and guiding principles necessary to plan for sound management and use of forest resources.

The forest survey of Oregon and Washington, an activity of the Pacific Northwest Forest and Range Experiment Station, was conducted in the Douglas-fir region during the period 1930-33, inclusive.* In 1937 work of keeping the survey up to date was commenced in counties in which there had been extensive depletion since the original survey.

The forests of King County, Washington, were first inventoried in 1932 and 1933 and a report summarizing results of the inventory was issued in 1934. The report, Forest Statistics for King County, Washington, gave preliminary statistics on timber volume, forest type area, and productive capacity of the county's forest land. In the summer of 1941 the inventory was made current through field examination covering the entire county and recompilation of the statistical data. In the field the reinventory consisted of examination of all cut-over areas logged prior to 1930 and all burned areas to determine the condition of regeneration, checking of location and extent of lands logged since January 1, 1930, as shown by cut-over reports, and mapping of lands cleared for agricultural use. The ownership status of all lands in the county was also brought up to date.

Results of this reinventory are given in this report which follows the one issued in 1934.

* Oregon and Washington were divided for survey purposes into two regions, (1) Douglas-fir region, consisting of that part of both States west of the Cascade Range summit, and (2) ponderosa pine region, that part of both States east of the Cascade Range summit. A regional report which includes an interpretation of the forest-survey data and analysis of the forest situation in the Douglas-fir region has been published and a similar report for the ponderosa pine region is now in the process of being published. Each region was divided into units--11 in the Douglas-fir region and 7 in the ponderosa pine region--for the purpose of more intensive analysis of data. It is planned to issue reports presenting findings for each unit.

are characteristic of the climate over the low-lying part of the county. These conditions favor the growth of Douglas-fir, which was found abundantly in pure stands. The east portion of the county is a rugged, broken, mountainous terrain, much of which is inaccessible. The elevations of the higher peaks and ridges vary from 6,000 to 8,000 feet. River valleys are deep and narrow with steep sides and some are no more than gorges. Weather conditions are severe in winter. The annual snowfall often amounts to 400 inches and subzero temperatures are common. This section of the county is suitable chiefly for forest use and some of the higher and more rugged areas produce stands which are useful for watershed protection and recreational purposes only. The hemlocks and balsam firs are the principal timber species. Logging is expensive and often cannot be done profitably on a small scale.

According to the Bureau of the Census, King County had 504,980 inhabitants in 1940, of which 75 percent were urban. Seattle, the county seat and largest city in the Pacific Northwest, is located around Elliott Bay on Puget Sound. As the leading seaport of the region, this city carries on, in normal times, a large shipping business with the Orient, Alaska, and other seaports of the Pacific Coast. In 90 years Seattle has grown from a pioneer settlement to the twenty-second largest city in the United States with a population of 368,302. A considerable number of manufacturing plants are located here. Forest industries figure prominently among these and rafts of logs are towed here from the adjacent territory to supply these plants. The lumber industry is an important factor in the prosperity of Seattle. Many large enterprises with operations in various other parts of the region have their headquarters here.

Transportation facilities are excellent. The county has an extended frontage on Puget Sound and in addition to the good harbor in Elliott Bay fresh water moorage for ships is provided in Lake Union and Lake Washington. Seattle is the terminus of three transcontinental railroads, the Great Northern, the Northern Pacific, and the Chicago, Milwaukee, St. Paul and Pacific. There is also a considerable mileage of logging railroads in the county that tap most of the forest areas. Modern high speed Federal highways cross the county both north and south, and east and west. State, county, and national-forest highways and private truck roads comprise an extensive road system that reaches into all but the inaccessible mountainous areas where travel is confined to horse and foot trails.

Inventory

King County's 1-1/3 million acres was found to be occupied by 23 forest and 2 nonforest cover types. A small-scale generalized type map showing in 4 broad groups the distribution of these types is presented in figure 1. A detailed 1-inch-to-the-mile county type map showing all the type detail mapped in the field is another product of

the survey. This has been revised and is current as of August 1941.[3/] Data concerning the acreage and ownership of the cover types of the county are presented statistically in tables 1 and 2. The acreage of forest land in the county is approximately four times greater than the acreage of nonforest land.

Forest Land

The forest land of King County, which amounts to approximately 1,095 thousand acres, has probably been reduced from its original size by about 200 thousand acres. That its total area will remain over a million acres for a long time to come is indicated by the fact that it has been reduced by less than a thousand acres during the last decade. Of the total area of forest land all but about 117 thousand acres is capable of growing commercial timber, chiefly Douglas-fir (table 4). It is important to keep such a vast area productive.

Saw-timber stands. The area of conifer saw timber totals 342 thousand acres and is located chiefly in the east half of the county. The largest body of saw timber is in the southeastern part between Green River and Cedar Lake (fig. 1). Another block of considerable size is found in the north along the Snoqualmie River and its forks. These areas of saw timber are stocked principally with western hemlock and fir-mountain hemlock types. No large areas of Douglas-fir saw-timber types remain but a number of lesser size especially along the Snoqualmie River and White River are still important.

Stands in which western hemlock is the predominating species occupy 114 thousand acres and those consisting mostly of the upper-slope species--Pacific silver fir, noble fir, alpine fir, and mountain hemlock--cover 99 thousand acres. Together these types occupy 62.4 percent of the county's total saw-timber area. The composition of the stands making up the western hemlock type (type 14) and the fir-mountain hemlock type (type 23) are quite similar in King County. Often a change of not more than 5 percent in the amount of western hemlock or balsam fir-mountain hemlock volume in a stand would change it from type 14 to type 23 or vice versa. Associate species are Douglas-fir, western redcedar, western white pine and Alaska yellow-cedar. Both types occur on the upper slopes and ridges beginning at elevations of about 2,000 feet and extending to about 4,700 feet, above which subalpine conditions prohibit commercial tree growth.

3/ One-inch-to-the-mile county type maps and 1/4-inch-to-the-mile lithographed State type maps have been prepared to show the location and extent of the forest types. For information address Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland, Oregon.

Table 1.-Area, in acres, of all forest cover types, by ownership class. Data corrected to August 15, 1941

Type no.	Type	Private	State		County	Municipal	Indian	Federal, available		Total
			Available	Reserved				National forest	Other	
4	Woodland: oak-madrone	385								385
	Douglas-fir									
6	Large old growth	35,045	5,875	90	425	1,130		8,540	125	51,230
7	Small old growth	6,580	780		460	2,525		8,725		19,070
8	Large second growth	27,040	3,240	135	1,205	120		9,745		41,485
9	Small second growth	107,850	7,565	330	6,835	1,850	405	6,415	435	131,685
10	Seedlings and saplings	110,740	14,920	165	8,060	29,830	90	21,690	380	185,875
	Sitka spruce									
11	Large	550	110							660
12	Small	100	10							110
	Western hemlock									
14	Large	48,420	8,795		1,110	6,865		48,895	150	114,235
15	Small	28,380	4,970		1,845	255		3,785	265	39,500
16	Seedlings and saplings	33,985	4,675		590	1,785		4,060	295	45,390
	Western redcedar									
17	Large	9,055	845		255	105		5,820	5	16,085
19	Small	330			20					350
	Fir-mountain hemlock									
23	Large	32,165	1,435		825	8,615		56,335	30	99,405
24	Small	5,075			245			14,175		19,495
	Hardwood									
31.5	Large	11,560	260	45	205	110	20	255	5	12,460
31	Small	24,695	740	25	935	435	480	630	340	28,280
33	Subalpine	17,820	1,925		1,050	325		57,735	725	79,580
	Nonrestocked cutover									
35	Cut prior to 1920	64,430	6,650		4,740	1,840	355	130	15	78,160
35A	Cut from 1920-29, incl.	28,270	3,340		1,050	580		545		33,785
36	Recent cutover, since 1930	36,735	4,870		675	3,105	80	7,210	155	52,830
37	Deforested burn	3,255			105			4,785		8,145
38	Noncommercial rocky area	11,520	865		960	175		22,620	960	37,100
	Total forest types	643,985	71,870	790	31,595	59,650	1,430	282,095	3,885	1,095,300
	Nonforest land									
3	In agricultural use	125,575	760		640	65	40		20	127,100
2	Other	81,030	165		620	1,540	55	50,585	335	134,330
	Total	850,590	72,795	790	32,855	61,255	1,525	332,680	4,240	1,356,730

Table 2.-Area, in acres, of generalized forest types, by ownership class
Data corrected to August 15, 1941

Type definition	Private	State		County	Municipal	Indian	Federal, available		Total
		Available	Reserved				National forest	Other	
Woodland: oak-madrone Type 4	385								385
Conifer saw timber Types 6, 7, 8, 11, 14, 17, & 23	158,855	21,080	225	4,280	19,360		138,060	310	342,170
Conifer second growth Types 9, 12, 15, 19, & 24									
On cut-over areas	99,410	5,070	275	5,935	1,495	405	875	500	113,965
On old burns	38,035	7,475	55	2,840	610		12,705	200	61,920
Total	137,445	12,545	330	8,775	2,105	405	13,580	700	175,885
Conifer seedlings and saplings Types 10, 16, 19, & 24									
On cut-over areas	129,835	18,865	165	7,675	31,155	90	12,550	430	200,765
On old burns	19,180	730		1,145	460		23,995	245	45,755
Total	149,015	19,595	165	8,820	31,615	90	36,545	675	246,520
Recent cut-over areas Type 36	36,735	4,870		675	3,105	80	7,210	155	52,830
Nonrestocked cut-over and burned areas Types 35, 35A, and 37	95,955	9,990		5,895	2,420	355	5,460	15	120,090
Hardwoods Types 31 and 31.5	36,255	1,000	70	1,140	545	500	885	345	40,740
Noncommercial areas Types 33 and 38	29,340	2,790		2,010	500		80,355	1,685	116,680
Total forest types	643,985	71,870	790	31,595	59,650	1,430	282,095	3,885	1,095,300
Nonforest land Types 2 and 3	206,605	925		1,260	1,605	95	50,585	355	261,430
Total	850,590	72,795	790	32,855	61,255	1,525	332,680	4,240	1,356,730

Generally, the amount of western hemlock decreases as the elevation increases. Western hemlock and Pacific silver fir are the most numerous and also the most important commercial species found in these types. Trees of these species at lower altitudes range from 16 to 60 inches d.b.h. with 3 to 10 sixteen-foot logs. They are of good quality, have fair clear length, and are generally sound. At the higher altitudes these species and their associates are quite short and limby. Cull because of defect also runs considerably higher. The principal value of the timber in these types is for pulpwood and watershed protection.

Douglas-fir saw-timber types extend over 112 thousand acres; a total of 70 thousand acres is occupied by old-growth timber and 42 thousand acres by second-growth timber of saw-timber size varying from 60 to 160 years in age. Large old-growth Douglas-fir over 40 inches d.b.h. (type 6), once the most extensive and by far the most valuable type in the county, now covers only 51 thousand acres. However, this class of timber is still important in the county because it is the source from which high-value logs are now being obtained and because it is generally accessible.

Second-growth Douglas-fir of saw-timber size is found on benches and lower slopes below 2,500 to 3,000 feet elevation, mostly in the west and south parts of the county. Individual stands are usually pure Douglas-fir in composition, even aged, and of satisfactory density. The majority have originated on old burns but some of the younger-aged stands found near the Sound occupy cut-over land and some are the result of economic selective logging. A large percentage of the stands are very accessible.

In addition, saw-timber stands of western redcedar (type 17) and Sitka spruce (type 11) stock areas of 16 thousand acres and 600 acres, respectively.

Immature stands. A total of 422 thousand acres, or nearly two-fifths of the county's forest land area, is stocked with immature conifer stands composed of trees less than saw-timber size. As might be expected in a county in which a large acreage of the original forest has been harvested, the bulk of the acreage stocked with these immature stands is cut-over land; only 25 percent of the area is restocked burns. Seven immature conifer types are found in King County. Table 3 shows their distribution by age class and degree of stocking.

Douglas-fir was the predominating species in the virgin stands prior to logging and this species continues to predominate in the second-growth stands that have restocked the cut-over land. Western

Table 3.-Area, in acres, of certain immature conifer forest types, by age class and degree of stocking

Data corrected to August 15, 1941

Age class (years)	Degree of stocking	Type number and name: 10 Douglas-fir seedlings and saplings	16 Western hemlock seedlings and saplings	9 Douglas-fir small second growth	15 Western hemlock small second growth	24 Fir-mountain hemlock second growth	Other 1/	Total
10	Good	9,940	2,420			155		12,360
	Medium	29,660	17,410					47,225
	Poor	19,460	9,895			155		29,355
	Total	59,060	29,725					88,940
20	Good	23,970	1,665			110		25,745
	Medium	74,735	7,690	895	5	9,720		93,045
	Poor	27,455	6,310	320	150	5,230	40	39,505
	Total	126,160	15,665	1,215	155	15,060	40	158,295
30	Good			3,290	975	300		4,565
	Medium	50		17,700	1,640	1,435	120	20,945
	Poor	605		4,000	255	1,280	5	6,145
	Total	655		24,990	2,870	3,015	125	31,655
40	Good			4,095	710	145		4,950
	Medium			19,515	1,960	410	70	21,955
	Poor			6,210	1,240		185	7,635
	Total			29,820	3,910	555	255	34,540
50	Good			2,415	70			2,485
	Medium			18,000	1,315			19,315
	Poor			5,780	1,125	10		6,915
	Total			26,195	2,510	10		28,715
60	Good			1,595	165			1,760
	Medium			5,955	750	235		6,940
	Poor			4,770	1,595			6,365
	Total			12,320	2,510	235		15,065
70	Good			2,460	60			2,520
	Medium			4,695	2,025	465		7,185
	Poor			4,950	2,565			7,515
	Total			12,105	4,650	465		17,220
80	Good			12,435	9,490			21,925
	Medium			2,870	7,715			10,585
	Poor			6,580	3,675		40	10,295
	Total			21,885	20,880		40	42,805
90+	Good				595			595
	Medium			1,295	615			1,910
	Poor			1,860	805			2,665
	Total			3,155	2,015			5,170
Total all ages	Good	33,910	4,085	26,290	12,065	555	190	76,905
	Medium	104,445	25,100	70,925	16,025	12,420	270	229,105
	Poor	47,520	16,205	34,470	11,410	6,520	460	116,395
	Total	185,875	45,390	131,685	39,500	19,495		422,405

1/ Includes 110 acres type 12, Sitka spruce second growth, and 350 acres type 19 western redcedar second growth.

hemlock has encroached on some areas. Seventy-five percent of the total area is restocked with Douglas-fir types, 20 percent by western hemlock types, and the remaining 5 percent by western redcedar and fir-mountain hemlock types.

As much of the early logged land in the west part of the county has been either cleared for settlement or burned over by numerous fires, the second-growth stands are found chiefly on the more recently logged areas in the central portion. Approximately 59 percent of the total acreage is occupied by seedling and sapling stands less than 25 years old. Of the acreage stocked with immature Douglas-fir and western hemlock stands, totaling about 402 thousand acres, 57 percent is stocked with trees less than 6 inches d.b.h. and the remainder by trees of pole size--6 to 20 inches d.b.h.

Second-growth stands on old burns are found principally in the east half of the county and are of the older age classes.

In density of stocking the immature stands of the county are about average for the Douglas-fir region; 18 percent were classified as well stocked, 54 percent as medium stocked, and 28 percent as poorly stocked.

Hardwoods. Hardwood types cover a total of 40.7 thousand acres of bottomlands and lower slopes in King County. They are especially prevalent along the Snoqualmie River and near the Sound. Red alder, bigleaf maple, and northern black cottonwood growing pure or in mixture comprise the composition of the stands. Stands on 28.2 thousand acres of the hardwood area are less than saw-timber size; those on 12.5 thousand are merchantable.

Deforested areas. There is a total of 120.1 thousand acres of commercial conifer forest land in King County devoid of conifer forest cover not including areas clear cut since the beginning of 1930. Areas logged prior to 1920 and nonrestocked after more than 20 years amount to 78.2 thousand acres, areas logged during the decade 1920-29 and still nonrestocked total 33.8 thousand acres, and deforested burned-off land sums up to 8.1 thousand acres.

Most of the nonrestocked cut-over areas once supported a fine stand of Douglas-fir and inherently it is the best forest land in the county. Nearly all is accessible and has topography favorable to cheap logging practices, but very little is suitable for agricultural use. A considerable part of the area of nonrestocked cut-over types is the result of unsuccessful endeavors of settlers to convert cut-over land into pasture through repeated burning. Lack of an adequate seed supply prevents many areas from restocking.

Deforested burns are located chiefly at high altitudes close to the subalpine zone. Their failure to restock is due mostly to the unfavorable seed-producing and growing conditions that exist there.

Areas clear cut since January 1, 1930, total 53 thousand acres. Regeneration on these lands has not been completely stabilized and no attempt to type them other than to classify them as recent cutovers (type 36) was made. They have resulted chiefly from the continued extension of long-established logging operations. Only since 1940 have many new logging operations contributed to this type's acreage.

Noncommercial forests. This category includes subalpine forests, areas of inferior tree growth on steep, rocky, or sterile sites below the altitudinal range of the subalpine forests, and woodlands. Subalpine forests cover nearly 80 thousand acres, all of which is located in the high, mountainous east portion of the county. They have very definite recreational value as they add greatly to the scenic beauty in summer and being open and park-like in character are used as ski grounds in winter.

Noncommercial forests on rocky and sterile sites occupy 37 thousand acres and are also principally found in the east part of the county. Their most valuable use is retarding excessive erosion and run-off during periods of heavy precipitation.

Woodland type covers only 385 acres. It is comprised of areas bordering on Puget Sound occupied by Pacific madrone.

Productive capacity of forest land. The relative productive capacity of the forest land, known as site quality, was determined during the forest inventory primarily to compute forest growth and volume of immature stands. All commercial conifer lands in King County were classified and the result is presented in table 4. Based on forest-cover types a total of 605.9 thousand acres was rated according to the Douglas-fir site classification and 331.6 thousand acres by the spruce-hemlock site classification.

As shown in table 4 over half the land in each classification falls in the middle site class III. Site I is lacking and the acreage of site V is insignificant. Growing conditions on spruce-hemlock sites are less favorable than on Douglas-fir sites. The productive capacity of the county is about average for the Douglas-fir region. The west half of the county has a higher productive capacity than the east half.

Nonforest Land

The nonforest land of King County totals 261 thousand acres. In the survey this acreage was classified as land in agricultural use and other nonforest land. Although nonforest land other than agricultural exceeds the farm land by 7 thousand acres, it is for the most part less important economically.

Table 4.-Land areas, forest land areas, and commercial conifer areas, by site quality class[1]

Data corrected to August 15, 1941

Kind of forest land and site quality class	Total area		Area in forest land	Area in commercial conifers
	Acres	Percent	Percent	Percent
Commercial conifer				
Douglas-fir				
Class II	135,905	10.0	12.4	14.5
Class III	339,065	25.0	30.9	36.1
Class IV	129,225	9.6	11.8	13.8
Class V	1,670	.1	.2	.2
Total	605,865	44.7	55.3	64.6
Spruce-hemlock				
Class II	22,820	1.7	2.1	2.4
Class III	168,665	12.4	15.4	17.9
Class IV	136,800	10.1	12.5	14.6
Class V	3,345	.2	.3	.5
Total	331,630	24.4	30.3	35.4
Total commercial conifer	937,495	69.1	85.6	100.0
Woodland	385			
Subalpine	79,580	5.9	7.3	
Noncommercial rocky	37,100	2.7	3.4	
Hardwood	40,740	3.0	3.7	
Total other	157,805	11.6	14.4	
All forest land	1,095,300	80.7	100.0	
Nonforest land	261,430	19.3		
Grand total	1,356,730	100.0		

1/ The "site quality" of a forest area is its relative productive capacity, determined by climatic, soil, topographic, and other factors. The index of site quality is the average height of the dominant stand at the age of 100 years. Five site quality classes are recognized for both Douglas-fir and spruce-hemlock types, Class I being the highest. In the survey, Douglas-fir classifications were used for Douglas-fir and western redcedar types; spruce-hemlock classifications were used for Sitka spruce, western hemlock, and fir-mountain hemlock types.

Land in agricultural use. Farm land, all located in the west half of the county, amounts to 127 thousand acres. This represents land originally forested, cleared, and now under cultivation or in pasture. Thousands of acres of very fertile level bottomlands, though heavily forested, attracted pioneer homesteaders and as markets increased agricultural development expanded. The largest area of bottomland and the first to be developed lies in the valley formed by the Duwamish and White Rivers. This area, varying in width from one to three miles, extends from the city limits of Seattle south to the county line. Most of the acreage in this district is devoted to truck farming, berry growing, dairying and poultry raising. Other important agricultural districts are located along the White River from Auburn to Enumclaw, along the Snoqualmie River south of North Bend, and in the vicinity north of Lake Sammamish and Lake Washington.

An agricultural development that has taken place during the last two decades and that is especially important in the forest situation is the rapid increase in the number of small farms. According to the Bureau of the Census, there were 3,801 farms in King County in 1920, 4,656 in 1930, and 5,760 in 1940. The average size of the farm unit in 1920 was 39.9 acres; in 1930, 29.6 acres; and in 1940, 26.5 acres. This change is not so much the result of more intensive occupation of established farm land as it is the creation of hundreds of new small units, many of which are located on land thought to be marginal or submarginal for agriculture within the forest zone where they greatly increase fire risk and give rise to other land-use problems.

Probably the area of farm land will not be materially increased in the immediate future. Except for small areas of hardwoods along river bottoms and a limited acreage of fertile upland, the county's unimproved land is not suited to agricultural use under current economic conditions.

Other nonforest land. This category includes city and industrial sites, barren and glacier country above timber line, open grassland, brush, tide flats, and unmeandered water. It totals 134 thousand acres.

Saw-Timber Volume

The volume of saw timber remaining in the county after nearly a century of logging amounts to 16.4 billion board feet. As shown in table 5 practically all is coniferous and over two-thirds is comprised of two species: Douglas-fir and western hemlock. The other major species are Pacific silver fir and western redcedar. Minor conifer species include noble fir, mountain hemlock, western white pine, Alaska yellow-cedar, Sitka spruce, alpine fir, and grand fir. Hardwood species are red alder, bigleaf maple, and northern black cottonwood.

Table 5.-Volume of timber by species and ownership class
Data corrected to August 15, 1941

Trees 16" and more d.b.h.[1]
Thousands of board feet, log scale, Scribner rule

Species	Private	State		County	Municipal	Indian	Federal, available		Total
		Available	Reserved				National forest	Other	
Douglas-fir									
Large old growth	1,691,939	201,107	3,434	21,642	66,618		543,552	5,477	2,533,769
Small old growth	482,031	42,477	661	10,698	151,880		443,015	1,053	1,131,815
Large second growth	781,819	137,489	4,559	28,010	878		338,472		1,291,227
Small second growth	298,452	53,874	506	16,070	3,586	934	22,341	2,864	398,627
Sitka spruce									
Large	55,820	6,011	74	8	1,527		549	178	64,167
Small	522								522
Western hemlock									
Large	2,530,908	389,822	217	56,878	276,323		1,754,428	7,019	5,015,595
Small	434,674	103,296	24	20,731	5,446		208,583	3,841	776,595
Mountain hemlock	54,076	2,800		375	210		185,506		242,967
Western redcedar									
Live	638,954	81,667	279	22,674	37,930		390,488	733	1,172,725
Dead	5,065	434		2	1,049		1,438		7,988
Alaska yellow-cedar	6,138	720		200	126		106,599		113,783
Western white pine	43,213	3,143		161	13,347		65,557		125,421
Pacific silver fir	1,238,845	124,595		41,863	258,089		1,445,720	1,203	3,110,315
Grand fir	849	13		8					870
Noble fir	112,387	385		2,670	52,052		176,972		344,466
Alpine fir							10,551		10,551
Red alder	15,536	940	48	347	146	71	2,210	21	19,319
Bigleaf maple	10,571	1,441	8	190	149	60	1,160	26	13,605
Black cottonwood	8,357	223		100	70	20	210		8,980
Total	8,410,156	1,150,437	9,810	222,627	869,426	1,085	5,697,351	22,415	16,383,307

1/ Trees of hardwood species taken from 12" and more d.b.h.

Conifer saw-timber volume. Although Douglas-fir is slightly less in total volume than western hemlock, more of it is economically available. Currently it also commands a higher market price. Because of its importance the volume, totaling 5.3 billion board feet, has been segregated by size classes which are indicative of quality. Nearly half the Douglas-fir saw timber is in large old-growth trees. This is timber of excellent quality commonly known as "yellow fir" and suitable for veneer and high grade lumber. Volume in small old-growth trees, which are usually found at higher elevations or on poorer sites, is generally inferior in quality and less accessible. It amounts to 1.1 billion board feet. Large second-growth trees ordinarily less than 200 years of age and often referred to as "red fir" contribute a volume of 1.3 billion feet suitable only for the common grades of lumber, piling, ties, and other low grade products. Volume in the smallest size class, trees 16 to 20 inches d.b.h., amounts to approximately 400 million board feet and is suitable chiefly for piling or ties.

The pulp species--western hemlock, mountain hemlock, the balsam firs, and Sitka spruce--contain an aggregate saw-timber volume of 9.5 billion board feet, equivalent to 58 percent of the total volume in the county. Stands of these species dominated principally by either western hemlock or Pacific silver fir are concentrated in the eastern part of the county and are largely in a virgin state. Most of the pulp species logged up to the present time have been in mixed stands of Douglas-fir or cedar and were logged concurrently with those species.

Western redcedar volume totals 1.2 billion board feet. It is important because it is a specialty wood used for shingles and in a minor degree for pipes, tanks, boat building, and other uses.

Hardwood saw-timber volume. The entire saw-timber volume of the three commercially important hardwood species is only 42 million board feet. Part of this is found in the merchantable hardwood types and part as an understory in conifer stands. Red alder and bigleaf maple are in demand for furniture stock while northern black cottonwood is used in wood pulp manufacture.

Ownership of Forest Resources

One private and seven public classes of ownership are present in King County and two of these, private and national forest, have approximately 87 percent of the land area and saw-timber volume.

Private. This is the largest and one of the more important classes of ownership in the county. It includes 851 thousand acres of land, 644 thousand acres of which is forest land, and 8.4 billion board feet of saw timber. Moreover, the better quality timber and the more productive forest soils are in this class. The bulk of the cutting has been on private land. The status of cut-over land is very

unstable and large areas are tax delinquent, or have passed into county or State ownership through tax foreclosure and transfer. A total of nearly 93 thousand acres of nonrestocked cut-over land, logged prior to 1930, is in private ownership.

National forest. National-forest land situated in the east half of the county comprises 333 thousand acres occupied by 5.7 billion feet of saw timber. Two species, western hemlock and Pacific silver fir, comprise most of the volume. Conifer types of saw-timber size cover 138 thousand acres; 131 thousand acres is noncommercial or nonforest land, and 50 thousand acres is occupied by immature types. All national-forest resources in the county are statutably available. Logging under government supervision and based on a sustained-yield policy has removed timber from 33 thousand acres, of which only 675 acres is nonrestocked.

Other public. Included in this category are lands in State, county, and municipal ownership; lands in Indian reservations, both tribal and trust allotments, managed by the Federal Government; and federally owned lands in lighthouse reserves and public domain. The State of Washington owns 72 thousand acres of forest land and a total of 1,150 million board feet of timber that is available for cutting; it also owns 790 acres of forest land and 10 million board feet of timber in State parks in which the timber is in a reserved status. A total of 32 thousand acres of forest land and 223 million board feet of timber is in county ownership. Municipalities own a total of 61 thousand acres of forest land and 869 million board feet of lumber, nearly all of which is owned by the City of Seattle and lies principally in the Cedar River Watershed. In addition to city-owned lands this watershed is comprised of federally owned national-forest lands and some in private ownership. The City of Tacoma also owns lands in the county in connection with a watershed on the Green River. Forest lands in the Indian reservations and in Federal ownership on lighthouse reserves and the public domain are of limited extent.

Forest Depletion

Since this area was settled nearly a century ago, the virgin stands of King County have been depleted by probably more than 35 billion board feet of saw timber. Merchantable timber has been removed by various depletion agencies from roughly 700 thousand acres. Cutting is the most important factor in reducing stumpage resources, although fire has contributed materially, while wind, insects, and disease are a small but constant drain upon mature forests. Burning of reproduction and small second-growth stands has depleted numerous areas of growing stock.

Cutting Depletion

Nearly all the timber cut in the county comes out of the woods as sawlogs. Reliable data on annual sawlog production which have been compiled since 1925 show that cutting was greater during 1925 than in

any subsequent year, although for the four years following it was close to this peak. This indicates that the period of greatest cutting may have been in years just prior to 1925 before the effect of diminishing raw material was felt. Log production in 1932 was the lowest of any year during the period 1925-40. The average annual sawlog production for each 5-year period beginning with 1925 is: 1925-29, 634.7 million board feet; 1930-34, 222.6 million board feet; and 1935-39, 309.9 million board feet. The production for 1940 was somewhat above the average for the previous 5-year period. It was still more in 1941. This upswing in sawlog production has been attributed to demands of national defense.

Other drains on the forest are materials cut for fuel wood, poles and piling, pulpwood, mine timbers, veneer block, posts, excelsior blocks, and shingle bolts. The total volume of these products is relatively small.

Cutting depletion is chiefly of Douglas-fir volume and as would be expected most of it is derived from old-growth trees that produce high-quality logs and veneer stock. However, considerable cutting of second growth of merchantable size is taking place and some stands that are at the peak of annual increment are being rapidly liquidated. The area occupied by large second-growth Douglas-fir, a class of timber growing very rapidly, has been reduced more than 12 thousand acres since 1933. The total board-foot volume cut during the period 1933 to 1941 from trees that were thrifty and growing rapidly can be conservatively estimated at 250 million board feet. At present, piling, ties, car decking, cants, lagging and mine props are being taken in great quantities from second-growth stands in the county.

Fire Depletion

In recent years no major fires have burned in merchantable stands but important losses occur annually in seedling, sapling, and small second-growth stands. Repeated fires on cut-over land not only kill the growing stock but also the source of seed supply needed for natural regeneration of the areas. Soil fertility is also impaired.

Forest Growth

Calculations of forest growth are based on the 1933 inventory data when 430 thousand acres of forest land maintained timber stands that were classified as adding net growth. Current annual growth for the year 1933 in board-foot volume computed for trees 15.1 inches or more d.b.h. was 60 million feet. The cubic-foot volume computed for trees 5.1 inches or more d.b.h. amounted to approximately 29 million

cubic feet. It is probable that the current annual growth for 1941 was greater than in 1933 because of an increase in the acreage and age of the growing stands.

It was calculated that King County's commercial forest land could produce 270 million board feet annually in trees 15.1 inches or more d.b.h. under intensive forest management. This figure, known as potential annual growth assumes that all commercial forest land would be producing at 75 percent of capacity. The cubic-foot potential annual growth would be 96 million feet.

Forest Industries

In 1852 the first steam sawmill built on Puget Sound was erected on a site that now lies in the heart of Seattle. From this beginning, lumbering in King County continued to expand until the more accessible supplies of raw material were exhausted. At present logging operations in the county produce an annual volume of sawlogs only about one-half that produced 15 or 20 years ago. Manufacturing plants have been less affected by the depleted log supply than woods operations for those located in Seattle or its vicinity can draw from the Puget Sound log market.

Logging operations vary in size from those capable of cutting about 5 thousand board feet a day to those with an installed capacity of 500 thousand feet or more per 8-hour shift. At present two companies, one in the vicinity of Snoqualmie Falls and the other near Enumclaw, produce the bulk of the county's annual volume of sawlogs. Other important logging operations center at Carnation, Falls City, Hobart, North Bend, and Skykomish.

Wood-using plants are concentrated in Seattle where the many advantages of a large seaport and log market are available. Sawmills, remanufacturing plants, shingle mills, furniture factories, and boat building shops are some of the woodworking industries located here. The sawmill with its accompanying planing mill, dry kilns, machine shop, etc. is the only important type of wood-using plant located outside the Seattle area. Large sawmills located at Enumclaw and Snoqualmie Falls have a combined daily capacity of 835 thousand board feet per 8-hour shift. Sawmills of less capacity are found in numerous communities throughout the county where raw material is available and several small portable-type mills are operated at the site of logging.

Comparison of Inventories

Present trends in the forest situation in King County are indicated by a comparison of the results obtained in the original inventory in 1933 and the reinventory in 1940. This comparison is shown in the following tabulation:

	1933	1941	Change
Area Data			
Conifer saw-timber stands	396 M acres	342 M acres	-14%
Conifer second-growth stands 6-20" d.b.h.	147 M acres	176 M acres	+20%
Conifer seedling and sapling stands, less than 6" d.b.h.	176 M acres	274 M acres	+40%
Nonrestocked cutovers and burns	118 M acres	120 M acres	+ 2%
Area cut over 1920-32	107 M acres		
Area cut over 1930-40		53 M acres	
Volume Data			
Saw-timber volume	18,649 million bd. ft.	16,383 million bd. ft.	-12%
Douglas-fir saw-timber volume	6,667 million bd. ft.	5,355 million bd. ft.	-20%
Other saw-timber volume	11,982 million bd. ft.	11,028 million bd. ft.	- 8%
Ownership Data			
Privately owned forest land	793 M acres	644 M acres	-19%
Privately owned saw-timber volume	12,030 million bd. ft.	8,411 million bd. ft.	-30%
National-forest forest land	187 M acres	282 M acres	+51%
National-forest saw-timber volume	4,383 million bd. ft.	5,697 million bd. ft.	+30%
Other publicly owned forest land	116 M acres	169 M acres	+46%
Other publicly owned saw-timber volume	2,236 million bd. ft.	2,275 million bd. ft.	+ 2%

During the period between inventories, which was approximately eight years, the area of the conifer saw-timber stands of the county was reduced at an average rate of nearly 7 thousand acres per year. As would be expected the acreage of small second-growth and seedling-and-sapling stands shows a strong upward trend. The area of nonrestocked

land increased in spite of the fact that 31 thousand acres of land classified as deforested at the time of the first inventory had restocked by 1941, as a total of 33 thousand acres clear cut during the decade 1920-29 was added to this group. There has been about half as much land clear cut in the county in the eleven years since 1930 as there was during the 13-year period 1920-32.

The comparison of volume data shows a trend toward the continued rapid depletion of saw timber, especially Douglas-fir. Net depletion of saw-timber volume between inventories was close to 2.3 billion board feet, 1.3 billion board feet of Douglas-fir and one billion board feet of other species.

An increase of approximately 49 percent in the total area of publicly owned forest land during the 8-year period was due to the transfer of foreclosed tax-delinquent private lands to the county and the State and also to the settlement of the Northern Pacific land-grant case whereby the Federal Government revested a large acreage.

Summary

Certain pertinent facts ascertained by the forest survey indicate the seriousness of the forest situation in King County and point the way toward some possible improvements. Economically available saw timber continues to be liquidated at a rate far in excess of either current or potential growth and, moreover, thrifty, growing stands are being cut prematurely because they are accessible, can be logged cheaply, and a strong market exists at present. Proper care should be taken to assure regeneration on cut-over lands following the harvesting of mature timber. As the old-growth stands are replaced by thrifty growing forests an increase in net growth can be effected. The harm that usually comes from the rapid cutting of old-growth timber is the establishing of large areas of nonrestocked cut-over lands and over-development of communities. Both of these conditions are present in King County. To keep them from becoming more of a problem further increase in the rate of harvesting should be discouraged. No immature stands should be cut.

The problems of idle forest land, land use, and fire protection are closely related in the county. There is little chance of reducing the acreage of nonrestocked cut-over land without adequate protection which has been hampered by attempted settlement of submarginal land in the forest zone. All such settlement should be discouraged. All possible aid should be given fire protection agencies. Planting should be done on nonrestocked land, where the seed supply is insufficient, after fire risk is reasonably reduced.

Ownership of forest land has a direct bearing on the forest situation. The resources on national-forest land will be utilized under sustained-yield forest management. Resources in private ownership have not been so cut in the past and now they are nearing exhaustion. All public and private timber owners should cooperate in the future toward a permanent solution of the forest problem of King County.